THE UNIVERSITY OF ALBERTA

A CLINICAL STUDY OF [illegible] AND ORAL READING IN [illegible] OF [illegible]

BY

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF EDUCATION

DEPARTMENT OF ELEMENTARY EDUCATION

EDMONTON, ALBERTA

FALL, 1970

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A CLINICAL STUDY OF AUDITORY PERCEPTUAL AND ORAL READING PATTERNS IN A GROUP OF DYSLEXIC BOYS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled A CLINICAL STUDY OF AUDITORY PERCEPUTAL AND ORAL READING PATTERNS IN A GROUP OF DYSLEXIC BOYS submitted by REBECCA SHANDLING in partial fulfilment of the requirements for the degree of Master of Education.

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ABSTRACT

This clincial study investigated auditory perceptual and oral reading patterns, and the relationship between these, in a group of ten dyslexic boys between the ages of eight and ten years.

Their auditory discrimination, auditory blending ability and short term auditory memory were measured at the beginning of the study. Samples of their oral reading and comprehension were obtained at monthly intervals over four months and miscues were analyzed using selected categories of K. Goodman's "Taxonomy of Cues and Miscues in Reading."

Findings from the analysis of the data revealed the following:

i) all the subjects had adequate auditory discrimination and auditory blending ability and inadequate short term auditory memory at the time of this study.

ii) all the subjects showed the greatest difficulty in auditory perceptual tasks that required them to hold a sequence in mind while performing an operation.

iii) in oral reading all the subjects showed greatest strength in processing syntactic information while reading and weakness in processing grapho-phonic and semantic information.

iv) all the subjects had difficulty integrating information from different cue systems while reading.

v) oral reading patterns did not remain stable for the group over the period of the study. Their ability to integrate grapho-phonemic information improved while their ability to integrate syntactic and semantic information with each other and with grapho-phonic information declined.

vi) the group was weakest in those aspects of the reading process most affected by short term auditory memory--semantic and grapho-phonic processing.

It was suggested that an underlying cause of the difficulty these boys experienced in both auditory perception and oral reading could be a weakness in the ability to co-ordinate different tasks required of them at the same time and that teaching methods of this group of dyslexic boys should aim to improve their auditory memory and their ability to integrate all cue systems while reading.

Research is needed on the levels of conceptual development and oral vocabulary of dyslexics at different ages, and on the specific relationship between short term auditory memory span and semantic processing of language units of different length and complexity.

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CHAPTER I

THE PROBLEM

Statement of the Problem

There are many and diverse causes for reading retardation in school children. Factors such as emotional disorders, mental retardation, cultural deprivation or sensory impairment may affect a child's ability to learn to read adequately, and in each of these instances the problems are different.

Frequently found in the literature are medical and educational reports of otherwise intelligent children who are unable to learn to read satisfactorily. They are children without serious emotional disorders, who have intact vision and hearing, who have had adequate language stimulation in their pre school years, and school learning opportunities considered adequate for the majority of children of similar background and intelligence. It is assumed that their reading disorders result from a dysfunction of the brain. A variety of terms has been used to label this problem from "congenital word blindness" to "specific learning disability" and "dyslexia."

Estimates of the incidence of dyslexia among school age children vary from five per cent (Myklebust and Bosches,

1960) to ten per cent (Hallgren, 1950; Heraranm, 1959; Rabinovitch, 1954). All agree that the difficulty is serious and persistent.

A description of a definitive "dyslexia" syndrome is not to be found in the literature. Rather, a number of characteristics of dyslexic children have been identified and it is the patterns and combinations of these characteristics in different children that are important in a study of dyslexia. Within the group of "dyslexic children" a wide variety of patterns are likely to be found. Therefore, it is through clinical studies that our understanding of dyslexia is likely to advance.

There is general agreement that language and reading are closely related and that dyslexia usually occurs as part of a general language disorder (Myklebust and Johnson, 1962). It is also established that dyslexic children experience the most difficulty in the decoding aspects of learning to read and that adequate auditory perceptual skills are essential to development of efficient word perception skills. Therefore, in a study of dyslexia, the interrelationship of language processes and the integrities essential for learning to read must be considered.

The research on dyslexia has left many questions unanswered about the auditory perceptual patterns of dyslexic children and their relationship both to the childrens' overall linguistic competence and the specific

difficulties they show in their reading. Neither has the research shown how different methods, (emphasizing the decoding aspects of reading), advocated to help dyslexic children, affect their ability to interrelate language processes in reading.

In the 1969-1970 school year, the Edmonton Public School Board established an adaptation class for ten children diagnosed as "dyslexic," between the ages of eight and ten years. The objectives of the experimental classroom were to explore the characteristics of these children and methods appropriate for teaching them to read. This study was designed to examine the auditory perceptual patterns of these dyslexic children and their ability to interrelate language processes, as revealed in their oral reading, over a period of four months. During this time they were being taught to read by a multi-sensory approach with primary emphasis on the decoding aspects of the reading process.

Purpose of the Study

The specific purposes of this study are:

a) to study the patterns of auditory perceptual ability of a group of ten dyslexic boys.

b) to study their reading performance over a period of time through an analysis of their oral reading miscues and in particular to consider their ability to integrate all

the cue systems operating in the reading process.

c) to relate their auditory perceptual patterns and their oral reading patterns.

d) to describe background data relevant to these concerns.

Background of the Study

Language and Reading

Many authorities stress the important relationship between reading and language, although they may not agree on the implications this relationship has for the teaching of reading. Thus, Myklebust and Johnson (1962) decry the concern with reading as a skill rather than an "integral facet of that significant, if not unique characteristic of human behaviour, language." It is frequently pointed out, too, that reading disorders are part of the basic language and learning disabilities. Thus Johnson and Myklebust (1963) state:

> "Dyslexia is more than a reading disorder. It is part of a basic language and learning disability and rarely occurs in isolation. The reading process is not an isolated skill but is an integral part of symbolic behaviour. Therefore, it is essential to consider both the hierarchy of language development, as well as the interrelationship of language processes in the study of reading disability. The integrities necessary for reading must be considered."

Because of the difficulty dyslexic children experience in establishing the sound-symbol relationship in learning to read, most methods that have been advocated to help the dyslexic child have leaned heavily on the decoding

aspects of the reading process. The aim, of course, has been the aim of all reading instruction--the understanding of what has been read.

Linguists who have turned their attention to the reading process have stressed too, the vital relationship between language and reading. And it is because of this important link that many linguists have been critical of the traditional methods of teaching reading. Thus, Goodman and Burke (1969) in summarizing four linguistic principles which they feel are very important in teaching reading or dealing with reading problems state that reading is not and exact letter by letter, word by word decoding process, but "a psycholinguistic guessing game, a process involving the integration of the child's grammatic system with his knowledge of the world and the printed page."

Lefevre (1968) criticizes such statements as Buswell's that "the unit in reading material is the same as the unit in speech--namely the word." K. Goodman (1967) states that traditionally the teaching of reading has been focused on words. Word recognition has been the target of instruction, particularly in beginning reading. The development of a basic sight vocabulary has been the aim of beginning reading instruction--and these basic sight words are words the child should recognize in all reading situations.

Goodman (1967) points out that linguistic knowledge makes the assumptions underlying this methodology untenable

Linguistic knowledge tells us that a word exists only within the flow of language and that morphemes and words have no existence apart from language. He points out that because of our preoccupation with the teaching of words, context is considered only one of many aids in word recognition and this has led to an oversimplification of the nature and complexity of context and how it operates.

de Hirsch (1963) agrees with the linguists that reading is "never a process of adding one sound or one letter to another" (p.284). However, she feels that

> "there is no dichotomy between part and whole learning since both are inherent in the reading process. . . . Whole words and whole sentences are obviously more meaningful than sounds are. However, the point about dyslexic children . . . is that they do need additional help with the structuring and organization of wholes and often do better with shorter configurations" (p.285).

In other words, it is the particular nature of the difficulties dyslexic children experience that seem to necessitate teaching methods that concentrate on establishing the sound/symbol relationships--and it is these particular methods that linguists claim are contraindicated by our knowledge of the nature of the relationship between language and reading.

It is important, then to consider reading disorders within the framework of general language competence--and a useful method for doing this is by studying the oral reading of such children. K. Goodman's taxonomy (1969) for the analysis of children's oral reading miscues is a tool that enables a researcher to examine children's oral read-

ing miscues in terms of the language processes that may be operating to produce the miscued response.

However, the taxonomy does not take cognizance of the underlying perceptual competencies that are generally agreed to be an essential part of language processes and reading development.

Myklebust and Johnson (1967) list the following as essential auditory perceptual abilities for reading development:

a) the ability to discriminate between similar and different sounds;

b) the ability to perceive sounds within a word;

c) the ability to remember the sounds of letters and blend them into words;

d) the ability to divide a word into syllables or into component sounds.

These authors state that their clinical findings and certain research studies suggest that the major problem of dyslexics is that they cannot convert from the visual symbol into the previously acquired auditory symbol. They have great difficulty learning the relationship between the sounds of the language and their written symbols. It seems that in these children the perceptual processes underlying the acquisition of the sound-symbol relationship are faulty.

Adequate auditory perception in relation to read-

ing presupposes adequate auditory perception for language development. In relation to reading, auditory perception is a composite of several skills or abilities, for example auditory discrimination of sounds in words, auditory memory of the sounds of letters and of a sequence of sounds, auditory blending of sounds into words and the ability to analyze words heard into their component sounds.

Questions

The study attempted to find answers to the following questions:

1. Are there patterns of auditory perception that emerge for individual subjects and for the group as a whole?

2. Are there patterns of oral reading performance for individual subjects and for the group as a whole that emerge from an analysis of their oral reading miscues?

3. Is there a relationship between the auditory perceptual patterns revealed and their difficulties in reading as shown by an analysis of their oral reading miscues?

4. Are the patterns of oral reading performance, revealed by an analysis of their oral reading miscues, stable over a period of time?

Definition of Terms

For the purposes of this study the following de-

scriptions and definitions are used:

1. The dyslexic child is described as one between the ages of eight and ten years who is at least one and one-half years retarded in reading (as measured on an oral reading test) despite ample opportunity to learn. The problem is not due to lack of intelligence, an emotional disturbance or any physical impairment other than a possible neurological one.

2. Auditory Perception includes the following abilities:

a) auditory discrimination:- the ability to detect likenesses and differences in speech sounds and to recognize the component sounds in words and their order.

b) auditory blending ability:- the ability to reproduce a word by synthesizing its component sounds or component syllables which have been presented orally.

c) auditory memory span:- the ability to repeat orally or to write down that which the subject has just heard.

3. Cue:- "anything which leads to reading responses whether correct or incorrect, expected or unexpected" Y. Goodman (1967).

4. Miscue:- an unexpected response to the printed material to be read.

5. Intelligence:- in this study the level of intelligence is measured by the WISC, administered to each child during the period March 1968 - April 1969.

Overview of the Study

The sample consisted of ten boys placed in an adaptation class in the Edmonton Public Shcool system. These boys were diagnosed by the Public School Board Education Clinic staff as "dyslexic" in the light of their own findings and the information available to them.

The following data were collected and recorded for each child:

1. Intelligence Quotient:- This was obtained for each child by the Educational psychologist of the Education Clinic using the *Wechsler Intelligence Scale for Children*. The test was administered to each child during his assessment period in the Education Clinic during the year 1968-1969.

2. Background Information for each subject. This related to their scholastic careers and medical histories and their family background and the medical histories of members of their families. This information was collected from the clinic files on each subject.

3. Auditory Perception:- The data on auditory perception were obtained by the researcher and Education Clinic colleagues during September 1969 - June 1970 as follows:

a) Auditory Discrimination

i) Wepman Auditory Discrimination Test

ii) Fast-Cosens Auditory Discrimination Test

b) Auditory Blending

i) Roswell-Chall Auditory Discrimination Test

ii) Illinois Test of Psycholinguistic Abilities: auditory blending sub-test

4. Oral Reading Samples:- a) The boys were examined at four successive monthly intervals (December 1969, January, February and March 1970) during the second week of each month.

b) During each session the child was asked

i) to read a list of words selected from the story he would read later.

ii) to read story material he had never read before.

iii) to retell the story in his own words with the book closed.

Each session was taped. All oral reading miscues for each child were analyzed using major categories of Goodman's Taxonomy of Oral Reading Miscues (K. Goodman, 1969).

Assumptions

1. It is assumed that these ten boys were correctly diagnosed as "dyslexic" by the staff of the Education Clinic, Edmonton Public School Board, of which the writer is a member.

2. The taxonomy was constructed on the assumption that all responses made by the reader while reading are caused, and not accidental, and that every response to the written text is a result of the interaction of the reader with the print. Since this taxonomy is used in this study, the assumption becomes a basic assumption of this study.

3. It is assumed that the information taken from the files of the subjects is an accurate reflection of the state of affairs at particular times.

Limitations of the Study

1. This study is limited to a group of only ten subjects.

2. No attempt was made to take account of individual differences in motivation and personality of these subjects.

3. Some of these subjects had received varying amounts of individual tutorial assistance before their placement in this particular adaptation class. In addition, some had spent all their previous school careers in regular classrooms, whereas others had spent some time in a special classroom.

Significance of the Study

There is growing pressure on the schools to provide adequate educational opportunities for dyslexic children. The results obtained in this particular class-

room may lead to recommendations regarding the desirability of such classes in the public school system or to recommendations regarding methodologies for these children.

These recommendations, in order to be useful, will have to be based on a thorough study of the patterns of strengths and weaknesses shown by these children.

Adequate auditory perceptual abilities, and language competence, are considered important for reading development. There have been studies that have dealt with the auditory perceptual abilities of retarded readers and achieving readers (e.g., Reynolds, 1953; Dykstra, 1966; Ewers, 1950; Bond, 1935). However, in these studies the populations of retarded readers have been undifferentiated. Some may have been dyslexic, but generally, in these studies of large groups of children the nature of the reading difficulty was not specified.

Very few auditory perceptual studies have been done specifically on a population of dyslexic children. Since it is established that auditory perceptual abilities are particularly relevant in the decoding aspects of learning to read and since clinical observations and studies have shown that dyslexic children have particular difficulty in the decoding aspects of learning to read, an examination of the patterns of certain auditory perceptual abilities (viz. auditory discrimination, auditory memory and auditory blending) in this group of dyslexic

boys will be useful.

Furthermore, it has been stated that dyslexia should be examined in relation to total language competence. An analysis of the oral reading miscues of these subjects should make it possible to observe the way in which they interrelate language processes in their reading. In addition, this analysis should make it possible to relate their auditory perceptual patterns and their particular reading difficulties with their ability to integrate language cues in reading.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

Factors Associated with Reading Retardation

Most children acquire reading skills, at a rate and level commensurate with their ability, without much difficulty. Many fail to learn to read adequately but measures of the incidence of reading difficulties vary according to the definition used. Rabinovitch (1954) has stated that one out of ten children fails to learn to read on a level commensurate with his mental ability.

The problem is serious and has engaged the attention of researchers in many disciplines for many years. These researchers have attempted to build up a body of knowledge about the significant factors associated with reading difficulties and the causes of reading retardation.

Much has been learned, but there is often little meeting ground between the various disciplines involved in the research. Some researchers, particularly neurologists and ophthalmologists, link an inability to learn to read satisfactorily with one primary cause viz., specific brain dysfunction. Others see reading disability as caused by multiple factors and still others are not in-

terested in causation but rather want to discover the psychological correlates of reading disability.

Doehring (1968) lists the following as factors associated with reading difficulties:

1. poor methods of teaching in school;
2. inadequate or inappropriate stimulation in the pre school years;
3. hereditary factors or disorders of pregnancy in the mother. This could cause deficiencies in abilities essential for success in reading.
4. impaired vision or hearing;
5. emotional disorders;
6. poor health;
7. slow development of oral language;
8. brain damage;
9. general mental subnormality;
10. subtle deficiencies in visual and auditory perception, fine muscular co-ordination, oral fluency.

This list is a general one and makes no attempt to group together factors that could be stated or that could be found together in various combinations. Thus e.g., hereditary factors or disorders in pregnancy in the mother could cause deficiencies in the abilities essential for success in reading and these deficiencies could be in visual and auditory perception, fine muscular co-ordination and oral fluency. Similarly, slow development of oral

language could be found with inadequate or inappropriate stimulation in the pre school years and/or with brain damage and/or with general mental subnormality.

Authorities in the reading field stress that it is seldom that one factor only would be associated with reading retardation. Rather, a combination of factors would be found in the majority of cases of reading difficulty.

Bond and Tinker (1961) in their discussion of the causes of reading disability state

> "The possible causes of reading disability are numerous. A single factor seldom causes reading disability. In all but the wildest cases the difficulty is due to a composite of related conditions. The contributing factors interact as parts of a pattern" (p.120).

Teachers are faced with helping children to overcome their disability. Basic to a successful remedial program in an exploration of all possible factors relating to the difficulty in an attempt to understand the nature of serious reading retardation and devise appropriate techniques to overcome the problem.

Classification and Definition of Dyslexia or Specific Reading Disability

There have always been reports in the literature of children with serious and persistent reading problems without obvious associated deficits or difficulties. This type of reading difficulty is often called by a variety of

names such as "dyslexia," "specific reading disability" or 'constitutional dyslexia' in an attempt to distinguish it from reading difficulties caused by a combination of other, more obvious factors. Dyslexia, or specific reading disability, therefore is characterized as "severe impairment of reading acquisition in a child who appears to be normal otherwise" (Doehring, 1968, p. 1). Johnson and Myklebust (1965) define dyslexia as "a reading disorder resulting from a dysfunction of the brain" (p.259).

However,there is considerable disagreement as to the best way to use the term 'dyslexia'--and as to the manifestations and etiology of this condition. This disagreement is reflected by the variety of terms used to describe syndromes that appear to be similar to each other (e.g., strephosymbolia, congenital word blindness). Some of these will be discussed below.

The problem is how to identify and characterize dyslexia so that it can be clearly distinguished from other forms of reading difficulty.

Critchley (1964) points out that neurologists believe that "within the general illiterate population, there exists a hard core of specific cases which are neither psychologically determined, nor yet a facet of mental backwardness" (p. 10). He goes on to classify dyslexia as an aphasia-like state--part of an inherent linguistic defect.

Eisenberg (1962) applies the term "specific dys-

lexia" to situations in which children are unable to learn to read with proper facility despite normal IQ, intact senses, proper instruction and normal motivation. "Specific" here implies that the cause of the condition is unknown.

Eisenberg's definition (1962)includes terms which are difficult to delineate exactly e.g., "proper instruction"--by this he presumably means conventional instruction, or instruction given to the general population.

Critchely (1964) uses three terms interchangeably: "specific dyslexia," "developmental dyslexia," "specific developmental dyslexia." He gives the following reasons for arguing that a specific type of developmental dyslexia exists quite apart from the general group of poor readers:

1. the persistence of the difficulty into adulthood;
2. the peculiar and specific nature of the errors shown in reading and writing;
3. the familial incidence of the defect;
4. the frequent occurrence of other symbol defects with dyslexia.

R. Rabinovitch's classification (1954) of poor readers into three groups is useful. He identified them as follows:

1. Cases of secondary reading retardation: These children have normal intellectual endowment but read badly because of exogenous factors.
2. Children who have reading difficulties resulting

from frank brain damage shown by gross neurological disease.

3. Cases of primary reading retardation: these children have no history of gross clinical findings to suggest disease however their basic capacity for learning to read is impaired.

The cases in the last group would correspond to what Critchely (1964) and Eisenberg (1962) call "developmental dyslexia." Rabinovitch further clarifies his concept of primary reading retardation as follows:

> "The capacity in learning to read is impaired without definite brain damage suggested in the history or neurological examination. The defect is in the ability to deal with letters and words as symbols, with resultant diminished ability to integrate the meaningfulness of written material. The pattern appears to reflect a basic disturbed pattern of neurological organization."

Summary

Many definitions and theories about dyslexia or specific reading disability have been advanced. They often differ and there is no common definition of dyslexia as yet. It has been suggested by a committee set up to study this problem (Adams, 1969) that much more needs to be learned before a universally acceptable definition of dyslexia can be framed, and that until more is known each research project must formulate its own working definition as needed.

Accordingly, the following definition of a dyslexic was adopted for this study:

> "A dyslexic child is one between the ages of eight and ten years who is at least one and one-half years retarded in reading (as measured on an oral reading test) as of September 1st 1970; thus despite ample opportunity to learn; The problem is not due to lack of intelligence, emotional disturbance or any physical impairment other than a possible neurological one."

In this study the terms 'dyslexia' and 'specific reading disability' will be used interchangeably.

Frameworks for Examining Dyslexia

In a recent study (Doehring, 1968), it was pointed out that many studies of specific reading disability were very narrowly conceived, since they viewed reading disability as a unique and isolated disorder. In order to be useful, it should be viewed in a general framework.

He feels that multiple factor theories of human ability such as those of Spearman and Thurstone provide a useful theoretical framework from which to explain specific reading disability. In children with specific reading disability, all abilities other than reading and perhaps a few abilities basic to reading, are presumed to be at an average or above average level. According to Doehring (1968), specific reading disability, if viewed in the context of a multiple factor theory of human ability, should be studied not as a unique disorder, but in the context of other possible patterns of disability (e.g., difficulty in numerical reasoning, and difficulties in the comprehension of spatial relationships.

Another context within which specific reading disability can be viewed is that of differential changes of ability resulting from localized cerebral dysfunction. Doehring (1968, p.4) states that theories which attempt to relate cerebral activity and human abilities have tended to vary from one extreme which identified specific cortical areas with specific intellectual functions to an opposite extreme which held that the brain functioned as an indivisible whole. Today, however, there seems to be general agreement that certain abilities tend to be selectively impaired by lesions which impinge on certain areas of the brain. Doehring summarizes the present state of knowledge in this area as follows:

1. Verbal abilities, in general, are most severely impaired by lesions of the "dominant" hemisphere. This is the left hemisphere for the majority of right handed individuals and for about half of the left handed individuals.

2. Expressive verbal abilities such as speaking and writing tend to be more impaired by anterior lesions and receptive abilities, such as listening and reading, by posterior lesions of the left hemisphere.

3. Reading ability may be impaired by lesions of the posterior region of the left hemisphere; and this visual verbal disability (commonly named "dyslexia") tends to occur in conjunction with other deficits of visual ability.

4. Certain non-verbal abilities tend to be most severely impaired by lesions of the non-dominant hemisphere--

usually the abilities involving the manipulation or construction of non-verbal forms or spatial arrays.

5. Sensory and motor abilities of the right side of the body tend to be more impaired by lesions of the left hemisphere; and abilities of the left side by lesions of the right hemisphere.

Neurologists early called attention to the similarities and differences between post traumatic dyslexia in adults and developmental dyslexia in children. Money (1962) and Doehring (1968) point out that dyslexia in an adult represents the loss of a previously acquired ability, whereas in specific reading disability or developmental dyslexia, the reading problem is almost always evident from the time the child begins to learn to read. Furthermore, developmental dyslexia frequently appears without demonstrable brain injury, although some of the symptoms associated with brain injury in adults may be present. However, Money does believe that much can be learned about developmental dyslexia from a study of post traumatic dyslexia. For example, knowledge about the effects of acquired brain lesions in adults can be used to make certain predictions about the expected pattern of non-reading deficits. Thus, e.g., reading disability should tend to occur in association with impairments associated with the posterior region of the left hemisphere. If this is so, other visual and verbal disabilities may occur in conjunction with reading disability. Many authors do point out

that the language and communication function may suffer general disablement, in an individual with specific reading disability, but it also may be selectively impaired with. Thus, Hinshelwood (1900) early described the condition as a "congenital defect occurring in children with otherwise normal and undamaged brains." Generally, there is agreement that there are variations as to the extent of involvement of other aspects of communication and other non reading abilities.

In this study the general frame of reference will be the language processing of the dyslexic children in relation to reading.

Theories About the Origin of Specific Reading Disability

Many explanations of the origin of specific reading disability or dyslexia have been offered. It is proposed to survey some of these theories and then to discuss studies which deal with specific deficits, particularly auditory deficits, associated with dyslexia.

Congenital Word Blindness

This was the term used by an English doctor at the end of the last century. He was describing a severe reading problem in a fourteen year old boy who apparently had no other intellectual defects. The ophthalmologist suggested that the disorder was the result of a deficiency in

the development of the left angular gyrus.

A Scottish ophthalmologist, Hinshelwood, is well known for a more thorough description of congenital word blindness. He published his work in 1917 and attributed specific reading disability to under-development of the left angular gyrus region, this being the area in which visual memory images of words and letters are stored. Hinshelwood (1917) reasoned that congenital word blindness must result from a cortical defect because of

1. the lack, in the patients he saw of a history of acquired brain lesions,

2. the intractibility of the reading problem.

However, it has been pointed out that no proponents of this theory have presented any direct evidence for lesions of the angular gyrus in cases of congenital word blindness. Critchley (1964) states that when Hinshelwood used the term in 1917 there was confusion in terminology already. The term "congenital word blindness" is seldom used today--but Critchley lists other terms used to denote this viewpoint regarding the origin of specific reading disability as: constitutional dyslexia, word amblyopia, specific reading disability.

Bond and Tinker (1961, p.99) point out that the term 'word blindness' describes a 'well-known condition' in adults. The patient is without memories for word forms as seen and the condition usually occurs after a brain

hemorrhage which destroys part of the visual area of the brain. Hinshelwood labelled this condition, 'acquired word blindness' and by analogy labelled the condition in young children, of extreme difficulty in learning to recognize printed and written language,'congenital word blindness.' They feel that it is not a useful nor an accurate analogy or label for use with young children.

Strephosymbolia

An American neurologist, Orton, coined this word in 1937. He observed the tendency of children he studied to reverse letters or transpose the order of letters, syllables and words in reading and writing. He also noticed among the poor readers he studied, a tendency towards left handedness or ambidexterity. He agreed with Hinshelwood that reading disability was a defect of visual perception produced by dysfunction of the left cerebral hemisphere. However, he stressed, as the major causative factor, faulty cerebral dominance or mixed dominance and he coined the word strephosymbolia to distinguish this disability from other types of reading disability. According to his theory, a specific reading disorder was said to occur when the reversed traces in the non-dominant hemisphere are inadequately suppressed by the dominant hemisphere because of delayed or incomplete development of cerebral dominance. Orton also stressed the relation of dyslexia to other developmental language disorders.

Orton's theory is not widely accepted among neurologists today, partly because its neurological propositions are difficult to test and partly because the patterns of reading, spelling and writing errors observed in children with specific reading disability cannot be explained very adequately in terms of confusions or mirror images. However, it is agreed that a typical or mixed dominance is very often characteristic of backward readers (Doehring, 1968).

Hereditary Factors

Critchley (1964) reports that as early as 1905 the familial incidence of dyslexia was noted. He describes the work of Scandinavian researchers as providing valuable evidence of the importance of genetic factors in dyslexia e.g.,

1. Norrie, in 1939, stated that there were familial tendencies in 'nearly all' her cases of dyslexia.
2. Skydsgaard published a study in 1942 of twenty-six children with 'constitutional dyslexia' and presented evidence (including fifty-six individuals in the families of those children with slight or more severe dyslexia) to illustrate familial occurrence and heredity.

The most extensive investigation of a possible hereditary factor in specific reading disability was conducted in Sweden by Hallgren in 1950. He studied and personally observed 276 cases. In these, 88 per cent had

reading problems in one or more members of their family.

Hermann's study in 1959, also presented evidence for a hereditary form of dyslexia. He proposed that the fundamental disorder in dyslexic children was right-left orientation. It was this disturbance that he said interfered with the development of reading ability by causing errors such as reversals and rotations and other confusions of visual symbols. He considered this under development of directional function to be a specific inherited factor in congenital reading disability and further related it to other symptoms usually associated with the lesions of the dominant cerebral hemisphere in the region of the angular gyrus. His inclusion of associated symptoms moves away from the idea of a 'pure dyslexia.' However, his hypothesized casual relationship between left-right confusion and reading disability has not been confirmed experimentally.

Hermann (1959), therefore defined dyslexia as: "a defective capacity for acquiring proficiency in reading and writing corresponding to average performance. This defective capacity is dependent on constitutional factors (hereditary) and exists in the absence of intellectual defects defects of the sensory organs or inhibiting influences in the external environment."

Other authors have noted the possiblity of hereditary factors in dyslexia.

Orton (1937) stressed the hereditary factor in his cases of dyslexia. Johnson and Myklebust (1965) state that Averbach in "The Science of Genetics" pointed out that a child might inherit a defect in the eighth nerve and be unable to hear. Likewise, he might inherit a specific type of deficit in the brain which precludes his ability to read normally. They also cite a study by Behrens (1963) that found a history of family language in learning difficulties in 58 per cent of his population (21 out of 38 children). Of this number 52.85 per cent were on the paternal side as compared with 2.8 per cent on the maternal side, indicating the possiblity of a sex linked genetic factor.

In their study of severe reading retardation, Heckerl and Sansbury (1968) worked with six children (ages 11-14) classified according to Rabinovitch's classification (five with primary reading retardation and one with brain damage). All the children had some degree of learning disability reported as being present in the family--at least one parent, mostly the father, had difficulty with reading and spelling.

In 1957 Vernon had pointed out that it was necessary to await further corroborative evidence before accepting that a certain form of reading disability can be inhereited as a simple genetic factor. In 1965, Johnson and Myklebust in their study of sixty dyslexic children found that it was impossible to state definitely that there

were positive hereditary factors in their sample because of the multiple etiologies that were frequently found. In 50 per cent of their cases, some language or learning problem was reported in at least one parent, sibling or grandparent. These difficulties were not necessarily reading difficulties but included speech, mathematics or other school learning problems. Of the thirty cases that reported familial learning problems, in only five instances was the hereditary factor the only possible significant factor. In the other twenty-five there were other factors which could have contributed to the specific reading disability.

It seems, therefore, that it is important to consider hereditary in attempting to understand the nature of dyslexia. However, the nature of the relationship between hereditary factors and dyslexia is not clear. Vernon (1957) points out that a plausible explanation is that there is a congenital disposition toward the occurrence of certain defects that are related, namely reading disability, left handedness, speech defects.

Pre Natal and Peri Natal Factors

McDonald Critchley (1964) states that as early as 1910 the suggestion was made in medical circles that birth injury was important in the genesis of dyslexia. He points out that unrecognized minimal birth injuries could be expressed later in such ways as speech retardation or/and

difficulties in learning to read. The fact that there is a higher proportion of reading disabilities among children born prematurely than among children born at term tends to support this theory.

Kawi and Pasamanick (1959) from their search of hospital records found frequent complications of pregnancy and frequent abnormalities of the pre-natal and para natal periods involving either the mother or the child. This frequency was significantly greater among cases of reading disability than among controls: there were complications with the mother's pregnancies in 16.6 per cent of the group of children with reading retardation--but only in 1.5 per cent of the control group of children with no difficulty in reading.

Paine (1965) points out that the proportion of cases in which abnormal circumstances (during the mother's pregnancy, at birth, or in the immediate neonatal history) are uncovered, would vary from clinic to clinic. Of the forty-eight cases that he tabulates, there were circumstances which constituted potential cerebral insults in thirty-two. The other sixteen had entirely normal births, but nevertheless experienced difficulty in learning to read.

Kawi and Pasamanick concluded that some of the reading disorders of children "constitute a component in the continuim of reproductive casualty consisting of cerebral palsy, epilepsy, mental deficiency and behaviour

disorders in children." They further concluded:

> "that the significance of the relationships between the prenatal, the paranatal and neonatal complications and these neuro-psychiatric disorders, namely cerebral palsy, epilepsy, mental deficiency, behaviour disorders and now reading retardation, makes up a descending series, with the more significant relationships first in the list above, appears reasonable, since certainly reading disability is a much more subtle condition and more subject to environmental influences than cerebral palsy or epilepsy" (p. 59).

It seems that there is little doubt that specific reading disability is often associated with prenatal and perinatal disorders. However, the exact way in which the supposed resulting structural impairment interferes with reading acquisition has not yet been determined. Furthermore, there are always some children who have perfectly normal birth histories, and manifest the other symptoms associated with specific reading disability.

Developmental Lag: Disturbances in Visuo-Motor Functioning

de Hirsch (1966) and Bender (1958) are the foremost proponents of the theory that children who experience difficulties in reading (that are not related to psychiatric disturbances, or extraneous factors such as frequent change of school, poor teaching or deprived environment) lag severely in physiological and psychological maturation.

Using the Bender-Gestalt test as the main criterion of visuo-motor disturbance in her work with language im-

paired children, de Hirsch (1954) found a notable immaturity of "gestalt functioning" in children classified as dyslexic. Gestalt disturbance as she used the term was characterized by:

a) difficulties in synthesizing visual configurations;

b) difficulty in experiencing spatial and temporal relationships;

c) impairment of figure-ground relationships;

d) primitive body image;

e) difficulty in responding to a constellation of stimuli as a whole;

f) diffulty in orderly recall of sequences;

g) deficiencies of temporal structuralization;

h) difficulty in the patterning of fine motor co-ordination.

Since skilled reading requires a high degree of integration and differentiation, it is small wonder that these children, showing immaturity in Gestalt functioning, experience great difficulty in developing reading skills.

According to Bender (1958), no specific structural defect or loss is present in dyslexic children, rather the deficits result from uneven development of different functional areas of the central nervous system, which normally unfold according to a congenitally determined pattern. To support this theory, Bender presented the following evidence:

a) the presence of immature neurological signs;

b) the presence of immature encephalographic patterns;

c) the presence of neurological deficits as demonstrated on psychological tests.

Explanations such as those of de Hirsch and Bender offer valuable guides to treatment. They are, however, difficult to prove or disprove by direct tests. de Hirsch, and others (1966) however, have attempted to do this by assembling a group of tests (including the Bender-Gestalt) for predicting later reading difficulty in children of kindergarten age.

In their study utilizing these tests, a group of subjects from the normal population and a large number of prematurely born subjects did poorly in reading at the end of the second grade. On the battery of tests administered to these children in their kindergarten year, the two groups of children functioned in ways characteristic of chronologically younger subjects. Their findings, corroborated by their clinical experience, supported their position that there is a close link between maturational lag and reading difficulties. However, this study was preliminary in nature and the results are still being validated on a larger population of subjects in New York City.

Birch (1962) described three aspects of perceptual maturation which could be relevant to an explanation of specific reading disability.

The first aspect is concerned with the sequence with which sensory systems develop in a child. Initially, the tactual kinesthetic system predominates, later vision and hearing. Where these distant sensory systems fail to develop in the normal manner, the child may not be ready to learn to read at the time he enters school--i.e., at the same time as most other children.

The second aspect of perceptual maturation has to do with the child learning to respond in an equivalent manner to different channels of sensory input. A deficiency in the development of abilities related to intersensory integration could directly interfere with the acquisition of the visual equivalents of spoken words and letters.

Thirdly, the maturation of perceptual abilities may take the form of an increase in complexity from an early level of simple discrimination through the ability to analyze and finally synthesize complex stimuli. Reading disability could result from inadequate development of these higher levels of visual perception.

The first and third aspects of maturation described by Birch could produce intellectual deficiencies too widespread to be labelled "specific reading disability." However, it does seem possible that specific reading disability could be the result of some abnormality of perceptual maturation.

Summary - Origin of Specific Reading Disability

A variety of terms has been used and varying explanations given by different authors of the nature and origin of dyslexia. All are agreed that dyslexia does occur, and that there is a variety of combinations of characteristics found in children who can be called dyslexic. Because they do differ from one another, most studies of dyslexic children have necessarily been case studies and knowledge about the syndrome and its origins has been gained through careful and detailed clinical observations and description. This study, then, will use the case study approach to determine patterns within a child and to determine whether any general patterns emerge for the group as a whole.

Relationship between Auditory Perception, Language and Reading

Authorities are agreed that perceptual development is a major factor in determining reading achievement. The perceptual factors most directly concerned with the reading act are those involving visual, auditory and kinesthetic abilities. This study is concerned with auditory perception and language processing as revealed in oral reading, and this section of the review will concentrate on the work that has been done on the relationship between auditory perception, language and the reading process.

Wepman (1961) defines hearing as "the overall ability to transmit, integrate and use auditory signals."

It can be divided into three separate parts viz., a) acuity; b) comprehension; c) perception. They develop chronologically in this order. He points out that comprehension is less dependent on the recognition of discrete units of sounds than it is upon the Gestalt--or total meaning acquired through the auditory pathway. The last part of hearing to develop is perception and this must develop sufficiently for the child to progress adequately in reading. Reading efficiency (particularly the word attack facet) is dependent on the ability to recognize the discrete units of sound.

Flower (1965) discussed the importance of auditory processes in learning to read. Firstly, language learning relies on auditory channels (this before the child learns to read). Secondly, the oral language is the foundation upon which reading skills are to be built and language is dependent on audition. Thirdly, reading skills themselves are dependent directly on auditory processes--particularly those reading skills concerned with decoding words.

MacGinitie (1967) pointed out that any method of teaching reading must relate the written message to the spoken language and, therefore, presupposes auditory perception skills at least adequate for understanding the spoken language. Whatever method is used to teach the child to read, the child must be able to discriminate and manipulate sequences of sound if he is to be successful. He includes in the ability to manipulate sounds:

1. the ability to segment spoken words into sounds that correspond in sequence to letters or letter groups;

2. auditory blending--the ability to reproduce a word by synthesizing its component sounds;

Myklebust and Johnson (1967) point out that although reading is primarily a visual symbol system, many skills are necessary for its acquisition. They list, for example, the following auditory perceptual skills as necessary for its acquisition:

1. the ability to discriminate between similar and different sounds;

2. the ability to perceive sounds within a word;

3. the ability to remember the sounds of letters and synthesize them into words;

4. the ability to divide a word into syllables or into component sounds.

Again, these skills they stress are closely related to the decoding aspects of learning to read i.e., to that aspect that converts the visual symbol into the previously acquired auditory symbol. Before a child can convert the graphic (visual) symbol, his auditory discrimination of speech sounds, his auditory analyzing and blending ability and his auditory memory must be adequately developed.

The above authors in discussing auditory perception have also pointed out the important relationship between language and reading. Generally, linguists and clinicians

who work with disabled readers stress the importance of viewing reading as one part of total language. Thus Carroll (1964) describes reading as "the perception and comprehension of written messages in a manner paralleling that of the corresponding spoken messages" (p.337). Myklebust and Johnson (1962) decry the concern with reading as a skill rather than "an integral facet of that significant, if not unique characteristic of human behaviour, language." They stress that the two verbal systems, the read and the spoken, constitute man's language and each can be understood only in relation to the other. Initially,the process of learning to read entails superimposing the read symbol onto the auditory and this presupposes adequate auditory and visual perception skills. Myklebust and Johnson (1967) have found in their studies of children who have dyslexia that "certain types of auditory disorders other than deafness preclude normal acquisition of ability to read" (p.15).

The Development of Auditory Perceptual Abilities

Flower (1965) points out that almost all auditory behaviour is learned.

> "Between the young baby's simple conditioned responses to sounds and the ability of the average child of school starting age to receive and decode an infinitely varied set of discrete auditory stimuli which distinguishes each of 3,000 plus words in his vocabulary, lies a very intricate set of learning."

As in the development of every human ability, Flower points

out, there is great variability in the auditory abilities of Grades I and II children and little is known of the stages through which normal children progress in the development of mature auditory skills.

MacGinitie (1967), too, stresses the developmental and learning aspects of auditory perception. He states that adults underestimate the problem of distinguishing between speech sounds. Their own ability is based on years of experience. Differences in speech sounds appear to have an acquired distinctiveness and differences in temporal order are probably based on differences in perceived quality that the listener learns to interpret as differences in order.

The conclusions of the above authors regarding the developmental nature of auditory perceptual abilities are corroborated by many studies. Thus Christine and Christine (1964) stated that "the development of auditory discrimination appears to be a maturational process; therefore, children develop auditory discrimination skills at different ages" (p.98). Myklebust (1960) has suggested that auditory functioning is not fully mature in a child until he reaches approximately seven years of age. Wepman (1961) in pointing out that auditory discrimination and retention must have developed sufficiently for the child to produce accurate speech and phonics for reading, stresses that each child develops at his own rate and that the auditory perceptual skills of some children may not mature until the eighth

year of life. It has been suggested by Goins (1959) that the pattern of development in each child is independent of age.

Wepman (1967) investigated the ability of Grade I and II children to make auditory discriminations between selected speech sounds using minimal word pairs. His findings indicated a decreasing number of children with poor discrimination as age increased. Studies by Thompson (1963) and Oberg (1969) substantially agree with those of Wepman. However, Dykstra (1966) found in his study that age did not seem to be a factor in determining whether or not skill in auditory discrimination is related to reading achievement.

In a detailed analysis of the auditory discrimination abilities of a group of Grade I children Cosens (1965) found that stops and nasals were the most difficult sounds for the first graders to discriminate, fricative-stop comparisons were also difficult, but fricatives, affricate-fricative comparisons and semi-vowel-lateral comparisons were relatively easy sounds to discriminate. Voiceless sounds were easier to discriminate than voiced. Sounds in word-final positions were more difficult to discriminate than sounds in initial or medial positions. Hearing similarities of speech sounds seemed to be easier than hearing differences.

The dyslexic boys in this study range in age from eight to ten years. It has been pointed out (Critchley,1964)

that dyslexics are unique amongst the general group of retarded readers in experiencing their difficulties for so long a time. In this study the pattern of auditory perceptual abilities of a group of dyslexic boys will be examined, including the extent to which difficulties experienced earlier in their school careers still persist. Such information may throw further light on the theory that dyslexia is a result of a developmental lag.

Relationship between Auditory Perception and Reading Disorders

Flower (1965) concluded that auditory disorders may figure prominently among the essential problems which underlie reading difficulties. He divides auditory disorders into two groups:

1. those that are essentially developmental or the result of inadequate or faulty learning, and
2. those that are the result of an impairment to, or dysfunction of, the auditory system.

The nature of developmental differences has been discussed earlier in this review. Under auditory difficulties associated with impairment or dysfunction, Flower lists: sensitivity impairment; memory and auditory discrimination difficulties and problems with the reception and decoding of rapid and complex stimuli. He emphasizes that auditory problems are commonly found in children with reading disorders and that many of them are essentially

developmental, because most aspects of auditory behaviour are learned. Sometimes the problems do reflect impairment to a function of the auditory system.

Many studies have dealt with the relationship between auditory abilities and reading ability. Many of them have dealt with auditory perception as a composite of many factors, others have grouped similar factors under the label "auditory discrimination."

One of the earliest studies was made by Bond (1935). He used sixty-four poor readers matched with a group of good readers on sex, age, I.Q., C.A. and grades (II and III). He investigated their auditory perceptual abilities. The tests used measured acuity, rhythm perception, blending, discrimination and memory of digits. His study showed significant differences between good and poor readers in auditory blending, auditory discrimination and auditory memory of digits.

Ewers' study (1950) differed from many others in that she studied 140 high school students. These students were given silent and oral reading tests and many tests of auditory functioning both in language and music. She found that syllable blending was correlated strongly with silent and oral reading. Letter blending was correlated with silent and oral reading to a lesser degree and correlations between auditory discrimination tests and silent and oral reading were low. This study, perhaps, reflects the delays that occur in the development of auditory per-

ception in children with reading disability as a function of age.

Another study which used older students was that done by Reynolds (1953). His sample consisted of 188 fourth grade pupils. The auditory abilities he measured included acuity, auditory memory span, auditory discrimination ability (tested by fifty item test of paired words) oral blending ability. He found that in three of the four schools from which his sample was chosen the auditory measures provided no significant predictive value, above that provided by mental age, in the relationship with the reading measures used.

In the fourth school, however, measures of auditory memory span, word discrimination ability and pitch discrimination ability, when combined in multiple regression equations provided significantly better predictions of reading measures used (general reading ability and word recognition) than those provided by the mental age.

These differences between the schools could, perhaps be due to differences in methods of teaching reading in the schools.

Reid (1962) studied the auditory aspects of reading readiness. She tested 118 children during their first year in school to determine their auditory aptitudes. She found that the relationship between auditory blending and reading became significant only after reading had been taught. Auditory discrimination of sounds in words was

significantly correlated with oral reading and word recognition.

Dykstra (1966) in his study used seven measures of what he called "auditory discrimination" using items from standardized, published tests. Seven tests were administered to a sample of 632 pupils in Grade I from eight randomly selected schools. Included were tests of auditory blending, discrimination of beginning and ending sounds in words and rhyming. Using the multiple regression technique, Dykstra found that auditory blending, discrimination of speech sounds and chronological age were not significantly related to reading achievement, whereas I.Q. and five other measures of auditory aptitudes were found to be significantly related to reading achievement.

Robinson (1946) found a functional auditory disturbance, such as inadequate auditory discrimination or insufficient auditory memory span for sounds was present in about 46 per cent of her sample with reading disability.

Wepman (1961), in summarizing the research findings on auditory discrimination states that there is a strong positive relation between poor discrimination and poor reading. He points out that adequate retention of individual sounds in mind is essential to the development of auditory discrimination. Therefore, failure to develop this latter ability adequately could be the result of a memory impairment. However, Durrell (1956) pointed out that the ability to tell whether words pronounced by a

teacher are alike or different has little relation to the auditory perception of elements within a word. High ability in telling gross differences between whole words does not mean the child has the ability to notice separate sounds in words which is what is required in word attack skills and in spelling. Johnson and Myklebust (1967) state further that "generally the dyslexic child, who fails gross discrimination tasks will be poor in analysis and synthesis but the reverse is not true" (p.181).

Durrell and Murphy in their 1953 study summarized their review of the studies of various aspects of auditory discrimination at Boston University as follows:

> "Although there were many factors which combine to determine the child's success in learning to read it is apparent that the ability to notice the separate sounds in words is a highly important one. Observations in our reading clinic bear out the above findings in intensified form. Almost every child who comes to a clinic with a reading achievement below first grade has a marked inability to discriminate sounds in words. Children who are severely handicapped in this ability seldom achieve primer level in reading. Some are so deficient in auditory analysis that the usual ear training exercises are useless. It is difficult to understand how children with excellent speaking vocabularies, clear enunciation, high intelligence and teaching related to reading achievement in phonics fail to acquire that ability."

Goins (1959) states that the accurate auditory perception of word sounds and their association with printed shapes causes considerable difficulty for many children. Certain refined perceptions must be made in the auditory realm for children entering Grade I. Children must eventually perceive:-

1. that each word's pattern of sound is a unit in itself;

2. that each word's sound pattern is a succession of sounds, always in the same order;

3. that these sounds are found over and over in different words, but in different order in different words;

4. that sounds correspond to letter shapes;

5. in English sound and symbol relationship varies considerably from word to word.

Studies of older, retarded readers, she states, show that their perceptual level (auditory and visual and the ability to associate the two correctly) is similar to that of the younger beginner.

Rogers (1968) in his review of the literature on auditory memory span and reading retardation summarized the research findings as follows:

> "Retarded readers (generally clinical cases from Grades IV to VIII) score below the level expected of their age and intelligence on tests of auditory memory. They also do less well than comparable groups of good readers. The former appear to have particular difficulty with digit span tests."

In his study of the auditory memory abilities of Grade II retarded-underachieving readers and competent achieving readers he found that the retarded underachieving readers were poor on auditory-memory tasks and he concluded that "there is a strong probability that poor auditory memory is a causal factor in reading retardation" (p.IV).

Some important studies have dealt specifically with the auditory blending aspect of auditory perception.

Chall and Roswell (1963) conducted a longitudinal study (Grades I-IV) after they noted in clinical work that children with severe reading disability had difficulty in blending and synthesizing sounds. Their study was set up to explore the relationship between auditory blending, I.Q., and reading achievement. Their subjects were sixty-two children in two first grade classes. They found that auditory blending ability whether tested in first, second, third or fourth grade was positively correlated with oral and silent reading ability through the fourth grade. It seemed to be more positively related to oral reading than silent (as measured by tests used in this study) and was most highly related to achievement in word attack skills. The children with I.Q.'s below one hundred were almost always among those with poor blending ability in Grades I-IV. There were, too a substantial number of children with higher I.Q.'s who also seemed to have difficulty with auditory blending. The authors speculated that poor blending ability would be a sign of neuro-physiological defect or a lag in development.

Huset (1961) compared two matched groups of Grade IV and V children with I.Q.'s ranging from average to superior. All had severe reading disabilities, but one group had adequate blending ability while the other had

inferior auditory blending ability. She found that the children who had severe reading difficulties, and auditory blending difficulties were more likely to have a basic and pervasive neurological involvement than children without blending difficulty. She concluded, too, that the primary difficulty in functioning of children with inferior blending ability is poor integration of both verbal and nonverbal material.

Other studies have found positive relationship between silent reading ability and auditory blending ability, e.g., Mulder and Curtin (1955) using fourth grade pupils; Vernon, (1957, pp.58-60), reported that her retarded readers lacked the ability to blend sounds correctly into words; and Monroe (1939) found that some children with reading defect had extreme difficulty with the test of sound blending.

Summary: Auditory Perception and Reading Disorders

Many authors have stressed the importance of auditory perception and language in the acquisition of reading skills. Some have based their conclusions on their observations of children with a specific reading disability in clinical situations. Others have based their conclusions on studies done with large groups of children with reading difficulties. A number of abilities have been included under the general term of auditory perception, viz:

a) auditory discrimination--or the ability to hear

likeness and differences between words;

b) auditory blending ability;

c) the ability to isolate words; the ability to analyze a word into its component sounds or syllables;

d) auditory memory span.

However, there is not always agreement as to the relationship between reading disorders and auditory perceptual patterns. There may be several factors that account for the inconsistency of the results, e.g.,

a) the tests used are not always the same, and in particular, tests that are too easy (or too difficult) will not discriminate well.

b) difficulties in auditory perception that contributed to reading difficulties may be largely left behind by the time the reading difficulties are studied. Thus, a child who initially had poor auditory perception skills may have progressed poorly in reading. Later his auditory perception may have matured--but his reading remained handicapped since instruction in the later grades never got back to the basic learnings he was unable to acquire earlier.

c) Dykstra (1966) pointed out at the end of his study too, that investigators are often too imprecise when talking of the relationship between auditory discrimination skills and reading achievement. Often, he states, it's more appropriate to talk of relationships which do exist

between certain test instruments and reading skills. Frequently the same skills are supposedly measured by two different tests. If instructions differ this would result in different evaluations of auditory discrimination ability.

Despite the variety of research done many questions remain unanswered, for example:

1. How do the patterns of auditory perception change as a function of variations in defining reading disability?

2. Would the pattern be different in groups of children from culturally deprived homes as opposed to children who cannot learn to read because of a neurological dysfunction? This study will examine the auditory perceptual patterns of a group of children diagnosed as being dyslexic.

3. How do the patterns of disability change as a function of age? This study will examine the auditory perceptual patterns of a group of dyslexic boys between the ages of eight and ten years. Some information relating to their auditory perceptual abilities when they were younger will be collated from the files, to determine any changes that have occurred in their performance.

Auditory Perceptual Characteristics of Dyslexics

Since dyslexia is a reading disorder, the research on auditory perception summarized in the preceding section should generally be applicable to a group diagnosed as dyslexics. Specific patterns of auditory perception may

differ.

In the discussion on the origin of dyslexia several characteristics of dyslexic children were pointed out. These included:

a) inconsistant dominance;

b) directional confusion or right left disorientation;

c) disturbances of writing, numerical ability;

d) delayed maturation of perceptual abilities.

Many other characteristics have been noted in research studies. This review of the research will concentrate on the findings regarding auditory perceptual characteristics of groups of children defined as having a specific reading disability.

Doehring (1968) described a comprehensive survey of reading abilities of a group of thirty-nine boys who were retarded readers despite an average performance I.Q., on the WISC, normal educational opportunity, satisfactory psychiatric status, vision, hearing, normal health and home environment. He used 109 measures to sample a wide variety of sensory, motor, perceptual and verbal abilities which might be relevant to specific reading disability. He compared the performance of the group of retarded readers with a group of normal readers of similar background and he found that;

a) the disabilities of the retarded readers were not restricted to the skills that required reading or spelling;

b) the normal readers were superior to the retarded

readers on 62/103 measures used;

c) that the pattern of deficit found in the nonreaders involved both verbal and nonverbal visual skills and both visual and auditory verbal skills. Furthermore, he found that for the retarded readers the tests requiring visual and verbal sequential processing were highly correlated with the reading factor, whereas for the normal readers the tests of oral vocabulary were highly correlated with the reading factor. Doehring points out that "in sequential processing the subject must 'keep in mind' the characteristics of the entire sequence as he proceeds through a series of responses which complete a given task." The mechanics of reading involve this--particularly in auditory blending--when sounds translated from graphic symbols are sequenced and held in memory while traces from the first sound are being fused with it to form a recognizable sound pattern. "Reading can be described as a sequential processing task which combines the visual requirement of perceptual speed tasks and the verbal requirements of sequential naming tasks."

Although this study involved a large number of tests, Doehring points out that not all classes of ability were thoroughly assessed. Thus, the severe impairment of the retarded readers in the one nonverbal auditory test (rhythm test) suggests that an auditory sequential processing disorder may have been found if nonverbal auditory abilities

had been assessed more thoroughly. He pointed out the need for a more complete survey of the auditory abilities of children with specific reading disability.

The tests that Doehring used and classified as auditory verbal tests tested the ability to obtain meaning from words heard. Wepman (1960) points out that the ability to discriminate sounds should not be confused with the ability to obtain meaning from words heard.

Kass (1962) set out to discover some of the psychological correlates of reading disability. She used the ITPA as the testing instrument, expanding it to allow for the assessment of additional psycholinguistic abilities.

The tests were at two levels of psycholinguistic organization:

1. the integrational level--these assess the child's ability in less meaningful, more automatic use of symbols; the use of grammar and rote memory (both short and long range) are the types of tasks at this level.

2. The representational level--these assess the child's ability in the meaningful aspects of language.

Her sample consisted of twenty-one children with reading disability. They were selected for the study using the following criteria: C.A. between 7.0-9.11 years. Normal I.Q. (Stanford Binet). Second, third or fourth year of primary grades; retarded in reading from one-half year (if in the second year in school) to two and one-half

years (if in the fourth year in school); no known visual or auditory defects.

Results showed that these children with reading disability differed from a "normal" group in certain psycholinguistic abilities:

1. They were better than normal in visual decoding (ability to understand what is seen) at the representational level.

2. They were poorer than normal in

   a) auditory-vocal association (the ability to draw relationships from what is heard) at the representational level.

   b) auditory-vocal automatic (ability to use the structure of language automatically) at the integrational level.

   c) visual-motor sequential (ability to reproduce a series of symbols presented visually) at the integrational level.

   d) visual-automatic (the ability to predict a whole from a part at the integrational level).

   e) sound blending: (ability to blend parts into a whole) at the integrational level.

   f) memory for designs.

   g) perceptual speed.

Generally, they showed more deficiencies at the integrational level than at the representational level of psychological functioning.

Myklebust and Johnson (1967) agree with the findings of Kass and Doehring. They state that their clinical experience and certain research studies suggest that the major problem of the dyslexic is not in understanding what he reads but in processing from the visual verbal to the auditory modality. Dyslexics fail to understand what they have read because they cannot convert the visual symbol into the previously acquired auditory symbol. Myklebust and Johnson (1962) reviewed two hundred cases classified as childhood dyslexia. They too found difficulties in learning sequences and temporal relationships as one of the characteristics of dyslexics. Amongst other characteristics they list are memory disorders and an inability to auditorize or visualize.

Authorities are agreed that success in reading (particularly in the mechanics of reading) requires a number of adequately developed auditory perceptual skills. It is frequently noted that dyslexic children have difficulty in establishing the sound symbol relationship in reading and therefore the auditory perceptual abilities particularly relevant to the establishment of that relationship should be investigated in any study of a group of children diagnosed as having a specific reading disability. In this study the auditory perceptual abilities of auditory discrimination, auditory blending and auditory memory will be investigated in a group of ten dyslexic boys.

Oral Reading and Language Processes

Many linguists have been critical of the traditional methods of teaching reading, because they claim that they do not take adequate account of this relationship between reading and language, e.g., Goodman (1967) points out that traditionally the teaching of reading has been focused on words. Word recognition has been the target of instruction, particularly in beginning reading. Words have been isolated and taught through drill, exercise and controlled reading materials. The word lists have been the basis for the development of sequential reading materials and the development of a basic sight vocabulary has been the aim of beginning reading instruction. These basic sight words are words the child should recognize in all reading situations.

K. Goodman (1967) claims that linguistic knowledge makes the assumptions underlying this methodology untenable. Linguistic knowledge tells us that a word exists only within the flow of language and that morphemes and words have no existence apart from language. He points out that because of our preoccupation with the teaching of words, context is considered only of many aids in word recognition and this has led to an oversimplification of the nature and complexity of context and how it operates.

Goodman states further that in order to understand how children learn to read we must learn how the individual

experiences and abilities of children affect their ability to use language cues. He also points out that it is necessary to be aware of the differences and similarities between understanding oral language which uses sounds as symbol units and written language which depends on graphic symbols. In a partial list of the systems operating to cue and miscue the reader within words he has the following:

Letter -- sound relationships

Shape, or word configurations

Known little words in bigger words

Whole known words

Recurrent spelling patterns.

However, he does not discuss the underlying auditory perceptual competencies or abilities which are necessary before a child can establish the letter and word--sound relationships.

Y. Goodman and Burke (1969) state that there are four linguistic principles to keep in mind when teaching reading or dealing with reading problems.

1. Children can be very knowledgeable about the grammatical structure of the language they use.

2. Children bring this knowledge of language to the task of reading.

3. Reading is a process which involves the interaction of language and thought.

4. Reading is not an exact, letter by letter, word by word decoding process. Rather it is a psycholinguistic guessing game bounded by the internalized rules of the grammatical system, his background of experiences, the printed page and the integration of these three.

Lefevre (1968) is another linguist highly critical of what he calls"the simplistic standard word perception theory of reading," because it does not deal with reading as a language related process.

He quotes Buswell's statement: "the unit in reading material is the same as the unit in speech namely the word" (p.349) as being typical of this approach. Far from the words being the basic units in reading, he states that the reader reads words not as units but as words ordered by the language system into sentences as units. Attention must be paid to syntax and intonation.

Other linguists who examined the reading process such as Bloomfield (1963) and sought phoneme-grapheme regularity in beginning teaching materials did not attempt to make a wider application of knowledge obtained from linguistics to reading.

Fries (1963) emphasized the relationship between speech and writing in terms of grapheme--morpheme correspondences.

Most of the linguists mentioned here,therefore, are united in their view that the unit in language and in reading is larger than the word and that reading must be

seen as a language related process.

K. Goodman (1969) within this framework, has developed a taxonomy for use in the study of oral reading--to help describe what happens when a reader, at any stage of proficiency reads orally. The taxonomy is based on the fact that the reader, as a user of language, brings his knowledge of language to the written page and uses it as he tries to recontruct the message encoded in the written page. It begins with the premise that all responses made by a reader to the graphic display are caused and are not accidental and that every response to the graphic display is a result of the interaction of the reader with the graphic display. The reader "concentrates his total prior experience and learning on the task, drawing on his experiences and the concepts he has attained as well as the language competence he has achieved" (p. 15).

The taxonomy is a useful tool for analyzing the reading process in relation to larger units of language through an analysis of oral reading miscues. However, the taxonomy seems to neglect the fact that, despite their many similarities, the differences between oral language and written language are very crucial; that some of the underlying competencies must be more highly developed for adequate development of reading skills than for oral language, and if these underlying competencies are not adequately developed, so that graphic cues can be properly utilized, the reader will not be able to bring to bear

his prior experience and general language competence in a useful way. Linguists really cannot tell us how the relationships between letters, words and sounds are established in the reading process. They do not take into account the body of research on underlying perceptual competencies that are necessary for adequate reading development.

Yetta Goodman (1967) utilized the taxonomy in her study of the development of oral reading phenomena in six readers during their first year of instruction. She found that the analysis of the development of children's beginning reading behaviour in relation to how the child processes language information was very fruitful. She found that certain types of miscues are of a higher order than others and that miscues of a low order gave way to miscues of a higher order developmentally in the six children she studied. However, she concluded

> "it cannot be stated that this hierarchy is the same for all children. The miscues of the more proficient readers in this study were more complex and involved more integration of the levels of language, cue systems, the graphic input and the experience and background of the child. The miscues of the less proficient readers tended not to be overly complex and included more miscues which were responses to the graphic field" (p.265).

Both linguists and reading clinicians then, stress the important relationship between language and reading and the need to view reading disorders in the context of language processes. In addition, it has been pointed out that auditory perceptual competence is an important facet

of both language development and reading development. Therefore, in a study of children with specific reading disability it is important to study and relate to each other patterns of auditory perception and linguistic competence and reading difficulties. The oral reading of children provides an opportunity to study and relate linguistic competence in relation to the reading process. K. Goodman's taxonomy (1969) provides a valuable tool for doing this. Since Goodman's taxonomy does not take account of the underlying perceptual bases of reading, tests of these abilities are included in this study. This study will then attempt to relate the patterns of auditory perception revealed in these children with their patterns of performance in oral reading.

CHAPTER III

DESIGN OF THE STUDY

This study was designed as a clinical study of ten boys who were thought to be dyslexic. The focus of the study was on their patterns of auditory perception in relation to auditory discrimination, auditory blending and auditory memory; and an examination of their oral reading miscues over a period of four months.

The Subjects

Selection Procedures

The children used in this study were ten boys in an experimental adaptation class in the Edmonton Public School system. These children had been selected for the class by the staff of the Education Clinic, Edmonton Public School Board. All had been referred to the Clinic by school personnel because of severe and persistent failure to learn to read at a level commensurate with their ability. They had been assessed by the multidisciplinary Clinic team (consisting of a social worker, clinical psychologist, speech and hearing clinician, reading specialist and classroom teacher) during the 1968-69 school year and were selected to meet the following criteria:

a) chronological age of between eight years and ten years as of September 1st, 1969,

b) average intelligence on either the verbal or performance section of the Wechsler Intelligence Scale for Children. This test had been administered individually to each child by the clinical psychologist of the Education Clinic. One subject had an I.Q., in the dull normal range; however, it was decided to include him since he met the other criteria and because of his failure to progress.

c) no sensory impairment. Auditory acuity was screened by the speech and hearing clincian using the Maico audiometer. Visual acuity was screened using the Bell and Howell Orthorater. In addition, each child received a medical examination from the medical doctor who acts as a consultant to the Clinic.

d) reading retardation of at least one and one-half years in terms of expected achievement level and I.Q., score. Reading achievement for the purposes of placement in this class was assessed using the Neale Analysis of Reading Ability. An average of the accuracy and comprehension scores, obtained by each subject, was used for this study.

e) no evidence of social problems in the family that could be contributing factors in the boys' learning difficulties. This was assessed by the Clinic social worker, after a structured interview with the parents of each subject, and after a study of the records available on

each child.

Background Information

1. School Careers

This is tabulated in Table I.

It shows that the subjects ranged in age from eight years, eight months to ten years, two months. The average age, based on their age as of September 1969, was nine years, three months.

All the subjects had spent at least three years in school before entering the dyslexic class. Various administrative devices had been employed to deal with the fact that they were not progressing as effectively as expected. As of June 1969, five of the subjects had been placed in the seven year program of the elementary school, one had repeated Grade I, one was repeating Grade II and three had spent at least one year in a junior adaptation class.

Their reading achievement scores at the time they entered the dyslexic class was computed by averaging the accuracy and comprehension scores of each subject on the _Neale Analysis of Reading Ability_. Each subject was at least one and one-half years retarded in relation to the grade he would have been expected to enter had he made normal progress in school.

2. Referral Problem

The primary reason for the referral of all these

TABLE I

BACKGROUND INFORMATION ON SUBJECTS: SCHOOL CAREERS

Subject	I.Q. (WISC) V	P	C.A. (September '69)	Grade (June '69)	Achievement Level (Oral Reading)	No. of Years in School Before Entering Dyslexic Class (by June '69)
A	87	114	8.11 years	II	1.9	3 (repeated I)
B	110	100	9.9 years	Jr. Adapt.	2.5	4
C	95	92	8.8 years	III/7	2.7	3
D	97	115	9.5 years	III/7	1.8	3
E	95	96	8.8 years	II	2.6	3
F	103	103	9.2 years	II	2.6	3
G	94	110	9.5 years	III/7	2.5	3
H	99	89	10.0 years	Jr. Adapt.	2.8	4
I	84	86	10.0 years	Jr. Adapt.	1.9	4
J	94	96	9.0 years	III/7	2.8	3
		Average Age:	9.3 years	Average:	2.4	Average: 3

ACHIEVEMENT LEVEL: Obtained by averaging the scores obtained by each student on "accuracy" and "comprehension."

subjects to the Education Clinic was reading difficulty which hampered school progress. The records of all ten subjects indicated that they had had this difficulty from the time they entered school. In five cases the referral stated that behaviour problems were beginning to accompany the reading problem. The problems mentioned were: immaturity, both behavioural and emotional; uncontrolled classroom behaviour and home behaviour--signs of tension and lack of interest. No subject had problems that warranted the attention of the psychiatrist.

3. Family Background Information

This section includes information about:

a) the occupation of the father (Table 2).

b) family structure (Table 3A and 3B)

a) Occupation

In terms of occupation of the father most subjects came from middle and lower middle class families.

TABLE 2

OCCUPATION OF FATHER

Occupation of Father	Number
Professional	0
Business Executives	0
Supervisor/Managerial	3
Sales or Skilled	7
Semiskilled or Unskilled	0

b) Family Structure

Table 3, A and B shows that all subjects were living with their natural parents and the family size reflected no characteristic trend. There was a slightly higher number of children from families with two siblings.

TABLE 3A

FAMILY STRUCTURE

Parents	Number
Natural	10
Ward Adoption	-
Father Only	-
Mother Only	-
Other	-

TABLE 3B

Number of Siblings	Number
Only child	0
One sibling	1
Two siblings	4
Three siblings	3
Four siblings	2

4. Medical History

a) Family

This was obtained by the Education

Clinic social worker in an interview with one or both parents prior to the subject's admission to the Education Clinic. The significant information in regard to certain physical and psychiatric disabilities and factors in the family is tabulated in Table 4.

TABLE 4

FAMILY MEDICAL HISTORY

Family History	Number
Alcohol	-
Migraine	5
Epilepsy or Convulsions	2
Allergies	8
Retardation	3
Learning Difficulty/Poor School Progress	8
Neurological Disease	1
Mental Illness	1
T. B.	4
Left-handed	5

The high incidence of allergies in the families of these subjects is noticeable. Medically, allergies are regarded as high sensitivity to the environment accompanied by manifestations of instability, short attention and concentration spans.

The percentage of families reporting learning disabilities or poor progress in school is also high. It is of interest in the light of the investigations by Hallgren, Orton and the Scandinavians indicating of possible familial,

genetic link in dyslexia.

b) Medical History of the Subjects

This is tabulated in Tables 5A-E.

TABLE 5

MEDICAL HISTORY OF THE SUBJECTS

A. Prenatal History	Number
Prior Caesarian Literine Operations	--
Seven or more Pregnancies	--
Blood Incompatibility	2
Toxemia	2
Bleeding	1
Infections	1
Smoking	--
X-rays	2

B. Birth and Newborn	Number
Induced	2
Prematurity/Postmaturity	3
Abnormal Presentation	--
Jaundice	2
Anoxia	--
Prolonged Labour	2
Prolonged Rupture of Membranes	--
Precipitate Labour	4
Transfused	1
Incubator	2
Discharged Mother	1
Genetic Defect Malformation	--

TABLE 5 continued

C. Abnormalities in the Developmental Milestones	Number
Feeding	1
Walking	--
Talking	6
Toilet Training	2

D. Childhood Diseases	Number
Chicken Pox	7
Rubella	7
Rubeola	4
Mumps	3
Scarlet Fever	--
Innoculation/Vaccine Reaction	1

E. Health	Number
Encephal/Men	--
Pneum/Broncia	--
E.E.G.	5
Head Banging	1
Sleep	4
Eating	--
Toxic Agents	2
Motor Dysfunction	4
Chronic Infections/Fevers	6
Sensory Dysfunctions: Sight - 1; Hearing - 0	

The prenatal histories of these youngsters appear to be normal. In their birth history (A) it was found that three were born prematurely, two births were induced, and of the two births induced one was a precipitate labour. Three other births were precipitate labours and the remaining two were prolonged labour. Thus, none of the ten children had normal births. Critchley (1964) wrote "that birth injury might constitute a factor in the genesis of dyslexia was first noted in Fisher 1910 . . ." (p.17). Various writers have since suggested that an unrecognized minimal birth injury may express itself in speech retardation and in later life by severe difficulties in learning to read.

Six of the boys suffered from high fevers during childhood. All of them had one or more of the childhood diseases. Five of the boys underwent an E.E.G. examination and three of them showed abnormalities. In examining the developmental milestones it appeared that the majority of the subjects showed deviations from the normal before school age. It was reported that six of the boys demonstrated abnormalities in the developmental milestones of talking, feeding and toilet training.

5. Intelligence

The information on the intelligence test scores of the ten subjects is listed in Table 6.

The I.Q., scores for the ten individual intelligence tests (Wechsler Intelligence Scale for Children) range

between 83 and 107. The mean I.Q., score is 98 I.Q. points. Only one subject scored below the average range; his score was 83.

TABLE 6

INTELLIGENCE TEST SCORES (WISC.)

Intellectual Classification	I.Q. Range	Number
Dull Normal	80 - 89	1
Average	90 -100	5
Bright Normal	110 -119	4

Summary

1. The ten subjects were all living with their natural parents; family size showed no characteristic trends.

2. All subjects had been referred for diagnostic help primarily because of a reading problem that had manifested itself from the time they entered school.

3. The family history of these subjects is marked for the presence of allergies and learning problems.

4. All ten subjects had abnormal births.

5. All ten tended to show deviations in the norm in developmental milestones before entering school.

6. The intellectual rating of these subjects is comparable with that of the average.

Data Collection and Analysis

Auditory Perceptual Abilities

Since measures of auditory perceptual ability in individuals vary with different testing instruments and with the different tasks required of the subject, auditory perceptual abilities in this study, were tested using a variety of testing instruments. The three auditory perceptual abilities that were measured were auditory discrimination, auditory blending and auditory memory.

In the following section, the tests used will be described, as will the purpose for giving each test.

1. Auditory Discrimination

a) Wepman Auditory Discrimination Test: This is an individually administered test, designed to identify children who have difficulty discriminating between phonemes in English. The child, with his back to the examiner, is asked to listen to forty pairs of words presented orally by the examiner. The child indicates whether the word pair is the same or different. Thirty of the forty word pairs are different, and ten are the same. The test is standardized and norms are provided. This test is recommended for "a quick and accurate assessment of auditory discrimination among children from five to eight years of age."

The subjects in this study were over eight years of age. Nevertheless, the test was administered for the following reasons:

i) the test has two forms. Most of the subjects had been given one form of the test, when they were first referred for study because of their reading difficulty. Administration of another form of the test would give a rough indication of their development, if any, in this area.

ii) past clinical experience had indicated that the test was a valuable instrument for use with a clinical population beyond the age of eight years. The test was administered to the subjects individually by the speech clinician of the Education Clinic, Edmonton Public School Board, in September 1969. The results were analyzed by the writer---and the results obtained by each subject on previous administrations of the test were collated from the files.

b) <u>Fast-Cosens Auditory Discrimination Test</u>: This test was designed at the University of Alberta in 1968 and is not standardized. It measures auditory discrimination of phonemes, using word pairs. It is more extensive than the Wepman Auditory Discrimination Test in that it consists of 266 items and includes the following items.

i) Comparisons of the velar nasal / / with other nasals in the medial and final position.

ii) Every possible comparison among voiced fricatives except those with /ž/.

iii) Every possible comparison among voiceless fricatives except those with /h/.

iv) Some comparisons of fricatives with non-fricatives in similar places of articulation.

v) Comparisons of affricates with fricatives in similar places of articulation.

vi) Comparisons between the semivowels /v, w/ and the lateral /l/.

vii) Comparisons among voiceless stops in the medial and final positions, and among voiced stops in the final position.

The test was administered by having the subjects listen to the items on a tape recorder and indicate whether the words in the pair were alike or different. If the words were different, they raised their hand; if they were alike, they kept their hand down. The subjects were given practice items to ensure that they understood the procedure. In addition, the taped items began with six practice pairs.

The test is a lengthy one and was administered in at least two periods of fifteen minutes each, with a short break between the periods.

The test was administered to the subjects in groups of four and five. One subject was away during the administration and the test was subsequently administered to him

individually. Screens were placed between the subjects to prevent them seeing each others' responses. The test was administered in the medical room of the school by the writer and two assistants.

The results were marked on sheets prepared for the purpose by the writer and the tests were marked and the results analyzed by the writer.

c) Monroe-Sherman Group Diagnostic Achievement and Aptitude Tests. Subtest: Orientation and Discrimination:

The Monroe-Sherman tests were designed to test reading achievement as well as certain aptitudes considered to be closely associated with the ability to learn to read. Only the section dealing with reading aptitudes was administered to the subjects. It was administered as a group test by the writer. In this study the subtests purporting to test auditory aptitudes only will be considered.

In the subtest "Orientation and Discrimination" the subjects are required to hold in mind a sequence of similar sounding words dictated by the examiner and then to select one as being the same as the word originally spoken by the examiner. He must indicate his choice by making the corresponding (X) in his booklet. This test, therefore, does require the ability to discriminate between words having only slight differences in sounds. In addition, however, it requires the ability to remember a sequence and relate it to a sequence of visual symbols.

The Monroe-Sherman tests are standardized and norms are provided. Raw scores were converted to percentile ranks in terms of chronological age.

2. Auditory Memory Span

Several tests were used to measure this perceptual ability, taken from several sources:

a) Monroe-Sherman Group Reading Achievement and Aptitude Tests: Auditory Letter Memory Test Subtest

The Monroe-Sherman tests and their method of administration to the subjects in this study were described above.

In the test of auditory letter memory, the subject is required to write down a sequence of letters of increasing length that has just been pronounced by the examiner at the rate of one a second.

b) The Illinois Tests of Psycholinguistic Ability (I.T.P.A.): Auditory Sequential Memory Subtest

The Illinois Tests of Psycholinguistic Ability have provided tools with which clinicians and researchers can examine the specific verbal abilities of many special groups of children including poor readers. This instrument provides measures of three processes utilizing the auditory and visual pathways. The processes are decoding (reception), association and encoding (expression). All these processes are measured on both the representational and automatic levels. Neville (1966) states, "The levels might be described as differing along a complexity continuum with the

representational level representing the more complex skill."

The I.T.P.A. was administered to each subject individually in September 1969 by the speech clinician of the Education Clinic, Edmonton Public School Board. The subtest utilized in this study was the subtest of auditory sequential memory. The test assesses the subject's ability to reproduce from memory sequences of digits increasing in length from two to eight digits. The digits are presented at the rate of two per second and the subject is allowed a second trial of each sequence, if he fails on the first presentation.

Norms are available for the I.T.P.A. and for this study the raw score obtained by each subject was converted to a psycholinguistic age norm.

c) Additional tests of auditory memory for digits and for letters were used and were taken from the series of tests developed by D. C. Rodgers in his investigation of the Auditory Memory Abilities of Grade II Retarded - Underachieving Readers and Competent - Achieving Readers, (1968).

The tests used in this study were:

i) <u>Letters Forward</u>

ii) <u>Digits Forward</u>

iii) <u>Digits Backward</u>

iv) <u>Letters Backward</u>

The digit tests consist of pairs of sequences increasing

in length from two to nine digits. The letters tests consist of pairs of sequences increasing in length from two to nine letters.

The letters of number names were spoken by the examiner at an even rate with approximately one second intervals, and the subject was asked to repeat them. In the digits backward and letters backward tests, the subjects were asked to repeat what they had heard in reverse order. If the first attempt at a sequence was correct, the alternative sequence of that length was omitted and the first of the following pair of sequences was read. When a subject failed the first of a pair of sequences he attempted the second sequence of that pair and, if he was successful, the test was continued. Testing was continued until the subjects failed both attempts at a given sequence length.

The tests were administered individually by the writer. The examiner and the subject faced one another during the test administration. Responses were given orally and written down by the examiner.

The scoring of the tests was done by the writer. Each test yielded a "span" score: the number of individual units in the longest sequence correctly repeated.

d) Auditory Memory for Unrelated Words Subtest: The Detroit Tests of Learning Aptitudes.

This subtest is administered individually. It consists of two sets of unrelated one syllable words.

Each set contains seven groups of words, the groups increasing in number of words from two to eight.

The subject is required to listen carefully while the examiner says the words in each group at the rate of one word per second--and then to repeat the words in the same order, if possible.

The examiner records the subject's responses by placing a number above each word indicating the order in which he repeats them. The entire group of words is given to the subject.

Norms are available with this test. A sample score was calculated for each subject by crediting him one point for every word recalled in any order in all spans. This simple score was converted to an age equivalent score.

3. Auditory Blending Ability

a) The Roswell-Chall Auditory Blending Test is designed to measure the child's ability to blend sounds heard into whole words. There is no visual element to this test, so it is not dependent on the child's knowledge of the sound-symbol relationship.

The test consists of three parts. Each part contains ten monosyllabic words to be blended. In Part I words are divided into two sounds, as i_s; in Part II the words are divided into two parts as s_at; and in Part III the words are divided into three parts as s_a_t. The sounds are presented at one minute intervals and the child

was required to put the sounds together and name the word formed in that way. The score is the total number of items correctly blended. The test is not standardized. In discussing its validity Aaron (1965) states:

> "This test, more an informal inventory than a standardized test, is useful for evaluating a pupil's ability to blend sounds he hears into words. Though the authors do not present convincing data to support the validity of the test, the test is probably valid for this one purpose" (p.830).

b) I.T.P.A.: Sound Blending Subtest

The I.T.P.A. has been described elsehwere in the study. The sound blending subtest is described as "another means of assessing the organizing process at the automatic level of the auditory vocal channel." (Examiner's Manual I.T.P.A., p. 12) On this subtest, the sounds of a word are spoken singly at half second intervals, and the subject is asked to tell what the word is. It is claimed by the authors of the test that the test covers a wider range of difficulty levels than most available tests of sound blending ability. "At one end of the scale it has been made applicable to younger children by including pcitures, thus making the task less open-ended. At the upper levels the test has been extended by including nonsense words."

4. Oral Reading Samples

Each child was examined by the experimenter at four monthly intervals (December 1969, January, February and March 1970), during the second week of each month.

a) Procedure

During each testing session the following procedure was followed:

i) an informal chat between the subject and the tester to put the subject at ease,

ii) the subject was asked to read a list of words selected from the story he was about to read. The lists were compiled by selecting every tenth word in the story up to a maximum of twenty words.

iii) the subject was then asked to read story material he had not been exposed to before.

iv) the subject was then asked to retell the story in his own words.

The complete session with each subject was taped using a Sony tape-recorder.

During each session, the subject was given a story at a level paralleling the one he was being instructed in at school. If the material was too difficult for him, he was asked to read easier material. If the material was too easy, he was moved ahead to more difficult material. The judgement as to whether the material was too easy or too difficult was a subjective one made at the time by the experimenter and based on the subject's performance on that particular day. Sometimes, time was limited and did not permit this procedure to be followed. The subjects were not given any help in figuring out the printed symbols that gave them difficulty, since the aim of the

study was to look at the process of reading in each subject and observe the strategies he was using while reading (Goodman, Y., 1967). The subject was encouraged to continue reading despite any difficulty he encountered. He was asked to "figure it out the best way you can then go on." If he still failed to carry on, he was encouraged to "guess at it, if you like, or else just leave it out and go on reading."

The number of selections read by each subject varied from session to session and from subject to subject, depending on factors such as fatique and attention span. Generally, however, each subject read at least two stories.

b) Reading Materials

The material used in this study was

i) Lippincott's "Basic Reading" series (1969).

ii) Ginn 360 Reading Program (1969),

These particular materials were used because the subjects had not been exposed to them before. In addition, the Lippincott readers emphasize the decoding aspects of learning to read, particularly in the earlier readers--the establishing of "relations between the spoken sounds and the letters that spell them" (McKracken and Walcutt - Introduction, Book A "Basic Reading.") In this respect they resembled the series of readers being used in the boys' classroom, ("Language Patterns" - Holt, Rinehart & Winston, 1968). However, the sequence in which the sound-symbol relationships are introduced differ in two series. It was assumed that the stories in both series were graded in difficulty.

c) Taping of the Oral Reading and Recording of Miscues

Each session was taped for each child. The subjects read the list of words from typed sheets and the stories from the printed book. Subsequently, the oral reading of each subject was checked by the researcher. This was done by following the child's taped reading using a typed copy of the story, called a marking sheet.

The following was recorded on the marking sheet:

i) Each miscue made by the subject-insertions, omissions, substitutions and reversals of letters, words or phrases.

ii) Intonational patterns that differed from the ones indicated by the punctuation marks in the printed material, e.g., if the print showed a period and the subject read through the punctuation, this was noted.

iii) Regressions:- Whenever the child reread any part of the story this was noted as a regression on the marking sheet. A note was made of the place the regression began to the place that the rereading began.

The list words that were not read correctly in the story were counted and the percentage of errors made by each subject on the list and in the stories at each session was calculated. The ratio of list errors to story errors was calculated.

d) Analysis of the Miscues

Each miscue was then analyzed, using the major categories of Goodman's Taxonomy of Cues and Miscues in

Reading. Goodman states:

> "The taxonomy provides a number of questions to be asked about each miscue, since the reader has, in every case, produced his response through the use of a wide range of information available to him in the reading process. . . . in any individual miscue, it is rare that one can say with strong assurance what exactly has taken place. But patterns which emerge produce a picture in depth of the reading process in the reader" (1969, p.19).

The taxonomy codes information about each miscue in a number of categories. Since it enables a depth analysis, a vast quantity of data is generated by such an analysis. It was not possible within the scope of this study to deal with every aspect of the results of the analysis. Rather the results obtained on selected categories dealing with the graphic and phonemic level, the syntactic and the semantic levels were selected.

The questions asked under each category were paraphrased from K. Goodman's paper presenting his taxonomy (1969). Some refinements were made to the criteria used for the points on the graphic and phonemic proximity scales, after discussions with the independent rater, to ensure greater accuracy.

A copy of the taxonomy code as used in this study is in the Appendix, page 280.

The results of the analysis in the following major categories of the taxonomy were used in this study:

i) Miscues Per Hundred Words:-This category was taken from Y.Goodman's study (1967) using the taxonomy, since she found that the percentage of miscues yielded im-

portant information. The definition of the extent was taken from K. Goodman's paper (1969) presenting the taxonomy viz., "the minimum test that can be included without leaving anything out. The word count is made on the expected response or the observed response, whichever is larger" (p.19).

i) Correction:- was an attempt made to correct the miscue or not? Was the attempt to correct successful or not? Was a correct response abandoned for an incorrect one?

ii) Word Phrase Identification:- When, if ever, was the miscued item read correctly, after the initial miscue? Was the same item read correctly earlier in the story? Did the subject vacillate between correct and incorrect responses for the same item?

iii) Observed Response in Periphery:- Were the miscues partially the result of processing visual cues out of sequence? Is the miscue in the near visual field (the line in which the miscue occurs and one line above and one line below) or in the extended field (two lines above and below)?

iv) Habitual Associations:- Did the reader form strong associations between words that influenced his reading? In this category substitution associations were noted only.

For the purpose of the taxonomy habitual associations were defined as two or more occurrences in the same

story of the same substitution.

v) Graphic Proximity:- How closely did the miscue resemble the stimulus graphically? A scale was used to measure the graphic similarity of the stimulus and the response. The scale ranged from 0, representing no graphic similarity between the stimulus and the response, to 9, representing homographs.

vi) Phonemic Proximity:- How closely did the miscue resemble the stimulus phonemically? A similar numerical scale was used to represent increasing phonemic similarity between the stimulus and the response.

vii) Grammatical Function of the Stimulus and the Response:- These were coded for both the stimulus and the observed response as noun, verb, adjective, function word, adverb or indeterminate. Non words were categorized according to inflectional ending and intonation, if possible.

viii) Levels of Language:- Each miscue was considered on each of the following levels:

Submorphemic

Bound morpheme

Word

Phrase

Sentence

Within each level, the miscue was further coded according to its type, i.e., was the response a substitution, omission, insertion,reversal for the stimulus, or any combination

of these?

ix) Syntactic Proximity:- How much did the syntax of the response differ from that of the stimulus? A numerical scale from 0 - 9 was used to represent points of increasing similarity between the syntax of the stimulus and the response. The mean score for all miscues was calculated for each subject.

x) Semantic Proximity:- How much did the meaning of the miscue differ from that of the stimulus? A numerical scale from 0 - 9 was used to represent points of increasing similarity between the meaning of the stimulus and the response. The mean score for all miscues was calculated for each subject.

xi) Syntactic Acceptability:- How acceptable was the resulting grammar of the miscue? A numerical scale from 1 - 5 was used to indicate various degrees of acceptability: not acceptable, acceptable with the prior portion of the sentence, acceptable with the subsequent portion of the sentence, acceptable in the sentence but not the passage, acceptable within the total passage.

xii) Semantic Acceptability:- How acceptable was the resulting meaning of the miscue? In judging acceptability, a similar scale of degrees of acceptability was used.

e) Comprehension: Recording and Analysis

Each subject was asked to retell the story he had just read. The writer said, "Tell me as much as you can about each story." When the subject had told as much as he could independently he was asked the following questions to determine how much he knew about the story:

1. Can you remember anything else?

2. Tell me more about -------- (a specific character mentioned by the subject in the retelling of the story;) or, if the subject could not recall anything about the story independently, he was asked "who was in the story" Tell me about them."

3. Did anything happen in the story that was funny or sad? Tell me about it.

In addition, the writer asked the subject to clarify points that were not clear from his recounting of the story or to explain words that he seemed to have difficulty with in the reading of the story.

The subject's retelling of the story and the subsequent conversation with the writer was taped.

Each subject's retelling of the stories was transcribed from the tape. A marking key was constructed for each story used in this study. The total number of points that could be obtained for comprehension for each story was twenty-five. A subject could obtain a score of from one to five in each of the categories.

Comprehension Rating

Main Idea of the Story	5
Important Details	5
Sequence of Events	5
Inference and Interpretation	5
Information Used for Pictures	5

Definitions

To ensure greater accuracy the following definitions were used for the purpose of this taxonomy. They were adapted from the following authors: H. A. Gleason, 1961; W. A. Francis, 1958 and Y. Goodman, 1967. These terms are not explicitly defined in K. Goodman's article (1969) explaining the taxonomy.

a) Graphic Shapes:- The printed symbols representing the language system

b) Phonemes:- The distinctive sounds of a language--they include the sounds of vowels and consonants.

c) Morphemes:- The smallest meaningful combination of phonemes in a language. Bound morphemes are combinations of phonemes which never stand alone but have a consistent meaning in the combinations into which they enter, e.g., plural endings, prefixes, suffixes.

d) Words:- Linguistic forms independent in distribution and meaning and capable of being written with space on either side.

e) Syntax:- The organizing of classes of morphemes and words into larger meaningful combinations.

f) Semantics:- The referential meanings of utterances and their relationships.

g) Phrase is two or more words in sequence.

h) Correction:- An attempt by the subject to change the original response.

i) Regression:- repeating or rereading any part of the reading material.

Rater Agreement in the Use of the Taxonomy of Reading Miscues and the Comprehension Scale

The taped readings of two subjects in the December session were used to determine the reliability in the use of the taxonomy. All the miscues made by the two subjects were coded by a reading clinician who was acquainted with Goodman's Taxonomy of Reading Miscues (1969). Her coding was compared to the writer's coding of the same miscues.

Agreements were computed in terms of percentages using the Arrington formula (Arrington, 1932). Accordingly, the number of classifications of miscues by the rater that agreed with those of the researcher were doubled and that number was divided by the same total plus the number of miscues which were dissimilarly classified. The formula is:

$$\frac{\text{2x agreements}}{\text{2x agreegments and disagreements}}.$$

The percentage of agreement between the rater and the re-

searcher was 90.2 per cent. Examination of studies using the Arrington formula indicates that this percentage of agreement may be considered satisfactory (Grant, 1965; Voice, 1968). An examination of the items on which the two coders did not agree led to a further definition of the points in the scales used to measure graphic and phonemic proximity and syntactic proximity. These were subsequently used by the writer in the analysis of the miscues made by the subjects in the four session.

The comprehension measure was explained to two reading clinicians who then listened to and rated the retelling of the stories by the two subjects used in the taxonomy reliability check. Once again agreements were computed in terms of percentages using the Arrington formula (Arrington, 1932). The percentages of agreement between the raters and the researcher are listed in Table 7.

TABLE 7

PERCENTAGE OF AGREEMENT BETWEEN RESEARCHER AND INDEPENDENT RATERS IN THE SCORING OF COMPREHENSION

	Percentage of Agreement				
	Subject D			Subject E	
Rater	Story I	Story II	Story III	Story I	Story II
1* and 2	91.8	97.8	96.2	86.6	85.7
1 and 3	87.1	93.2	88	96.2	96.0

*1 is the researcher

Examination of studies using the Arrington formula indicates that these percentages of agreement may be considered satisfactory (Grant, 1965; Voice, 1968).

Treatment of the Data

Auditory Perception

The raw scores made by the subjects on the auditory perception tests were recorded. Where norms were available for the tests given, the raw scores were converted into age equivalent scores, percentile ranks and ratings. For purposes of determining patterns of auditory perception, error scores on each test were converted to percentages of the total scores.

Within each test, the data for each individual was examined and compared to the data obtained for the other subjects, to determine whether any characteristics emerged for the group as a whole.

To determine what patterns of perceptual abilities emerged for individuals and for the group as a whole when all the auditory tests were considered together, the error scores on each test were converted to percentages and collated on bar graphs.

Graphs were also prepared to show the relationship, for the group, between results.

Oral Reading

The oral reading miscues for each session were

coded using the Taxonomy. The miscues in each subcategory were totalled and an electronic calculator was used to compute percentages and means. Comprehension scores for each subject for each story were obtained using the marking keys. The information yielded was analyzed as follows:

a) the data for each individual subject was compared, where relevant, from one session to the next and within a session, from story to story;

b) the data was examined to determine what patterns of performance, if any, emerged for individuals and for the group as a whole;

c) data for individual subjects was examined to determine how his particular pattern of reading behaviour differed from or resembled any group patterns which emerged;

d) Group patterns of performance in oral reading were compared to group patterns of performance in auditory perception to determine what patterns of relationship merged among the data.

CHAPTER IV

FINDINGS: AUDITORY PERCEPTION

The purpose of this chapter is to examine the results obtained on a group of auditory perceptual tests. The results will be examined firstly, to determine whether any patterns emerged for the group as a whole in relation to auditory discrimination, auditory blending and auditory memory. Then the results will be examined for each individual subject to determine individual patterns of perceptual performances. Finally, a comparison will be made between results obtained in the examination of the individual patterns of performance to determine what patterns of perceptual performance emerged for the group as a whole. Since the results obtained on the auditory perceptual tests were reported in a variety of ways, error scores were converted into percentages for purposes of comparison.

Auditory Discrimination

Wepman Auditory Discrimination Test

The norms provided for this test indicate that children of eight years of age and older are considered to have

adequate auditory discrimination ability if they make no more than three errors on the thirty pairs of dissimilar words presented to them. The subjects in this study were all above eight years of age. The average score on the Wepman test administered in September-October, 1969 was 28.3 indicating adequate auditory discrimination ability for the group as a whole, as measured on this test. Only one subject (Subject C) showed inadequate development in September-October, 1969, as measured on this test. All these subjects had a history of poor school progress before they were placed in the experimental class. All had been referred by their home school to the reading specialists of the Bureau of Child Study at different stages of their early school career. In turn the reading specialists had referred the children to the Education Clinic for further study. The Wepman Auditory Discrimination Test is a standard diagnostic instrument used by the reading specialists. Therefore, the files of all these students had records of the results of previous administrations of one or other of the two forms of the Wepman. These results were collated for each subject of the study are tabulated on the following page. The conclusions from, and discussion of these results that follow, is done recognizing the following limitations:

i) The tests were not administered to all the subjects by the same person under the same conditions. Occasionally, one worker had dealt with two subjects. The

TABLE 8

CHANGES IN AUDITORY DISCRIMINATION AS MEASURED BY THE WEPMAN AUDITORY DISCRIMINATION TEST

Subject	Date of Birth	Date of Test	Score	Adequate/ Inadequate	Grade
A	Sept.14 1960	June, 1968 C.A.: 7-9	13X	inadequate	Repeating Gr.I
		March,1969 C.A.: 8-6	3X	adequate (borderline)	Gr. II
		October,1969 C.A.: 9-1	3X	adequate (borderline)	Sp. Class
B	Nov.6 1959	March,1966 C.A.: 6-4	11X	inadequate	Gr. I
		Sept. 1968 C.A.: 8-10	3X	adequate (borderline)	Sp. Class
		October,1969	0	adequate	Sp. Class
C	Dec.23 1960	Feb. 1969 C.A.: 8-2	4X	inadequate	Gr. III/7
		Oct. 1969 C.A.: 8-10	4X	inadequate	Sp. Class
D	Mar.28 1960	Nov. 1967 C.A.: 7-8	17X	invalid	Gr. II
		April,1969 C.A.: 9-1	6X	inadequate	Gr. III/7
		Sept. 1969 C.A.: 9-6	1X	adequate	Sp. Class
E	Dec.12 1960	Jan. 1969 C.A.: 8-1	4X	inadequate	Gr. II
		May, 1969 C.A.: 8-5	3X	adequate (borderline)	Gr. II
		Oct. 1969 C.A.: 8-10	1X	adequate	Sp. Class
F	June 13 1960	Oct. 1968 C.A.: 8-4	2X	adequate	Gr. III/7
		March,1969	0	adequate	Gr. III/7

TABLE 8 - continued

Subject	Date of Birth	Date of Test	Score	Adequate/ Inadequate	Grade
G	Mar. 13 1960	May, 1969 C.A.: 9-2	4X	inadequate	Gr. III/7
		Oct. 1969	3X	adequate (borderline)	Sp. Class
H	July 9 1959	Oct. 1967 C.A.: 8-3	8X	inadequate	Repeating Gr.II
		Oct. 1969 C.A.:10-3	1X	adequate	Sp. Class
I	Aug.29 1959	Nov. 1967 C.A.: 8-3	testing discontinued, results invalid	-	Gr. II (repeating Gr.I)
		Oct. 1969 C.A.: 10-2	1X	adequate	Sp. Class
J	Sept.1 1960	Oct. 1967 C.A.: 7-1	5X	inadequate	Gr. II
		Mar. 1969 C.A.: 8-6	3X	adequate (borderline)	Gr. III/7
		Oct. 1969	2X	adequate	Sp. Class

subjects came from different areas of the city and the specialist called in for consultation was the one responsible for that school. However, it should be pointed out that all the specialists administering the test were qualified clinicians.

ii) The intervals between the administration of the tests differed for the subjects.

iii) The chronological age of each subject at the time of the first and subsequent administrations of the test differed.

Nevertheless, it is felt that the following observations from the file information are valuable:

a) All the subjects except one (Subject F) showed inadequate auditory discrimination (as measured on the Wepman) during the early part of their school career.

b) Of these nine subjects all except one (Subject C) had developed adequate discrimination (as measured by the Wepman) by the time they were placed in the experimental class.

This seems to confirm the developmental nature of auditory discrimination. It also raises the possibility that immaturity in this aspect of auditory perception was characteristic of these subjects when they started school and was a contributing factor to their slow progress in learning to read.

Monroe-Sherman Diagnostic Reading Aptitude and Achievement Test

In the Auditory Aptitudes subtest "Orientation and

Discrimination" the subjects were asked to listen for one particular word (which was named) in a group of four dictated by the examiner. They were then asked to circle the one, of four marks, that corresponded to that word. The tests required close attention to small differences in words, and also required them to remember the position, in a short sequence, of the chosen word.

The score obtained by each subject was translated into a percentile as compared to chronological age. The norms provided with the test use percentile ranges to indicate "superior," "average" or "inferior" performance on this subtest.

Four of the subjects obtained a percentile rank that could be classified as "average." The six other subjects all obtained a rank that was classified as "inferior" as compared to their chronological age. Table 9 shows the results of this subtest. Of the six subjects who obtained an "inferior" rating, therefore, three scored below the norms provided and the other three scored at the twentieth percentile or below. It has been pointed out that in addition to the auditory discrimination of different sounds in words, the ability to keep a sequence in mind seems to be involved in this subtest. In addition, this test combines a visual element with the auditory one of listening. It is difficult to evaluate which of these aspects of the tasks influenced the performance of the different subjects more than others. A possibility that suggests

TABLE 9

RESULTS OBTAINED ON MONROE-SHERMAN GROUP APTITUDE TEST: DISCRIMINATION AND ORIENTATION

Subject	Chronological Age	Percentile	Rating
A	8 years, 11 months	below norms	Inferior
B	9 years, 9 months	60th	Average
C	8 years, 8 months	below norms	Inferior
D	9 years, 5 months	50th	Average
E	8 years, 8 months	20th	Inferior
F	9 years, 2 months	15th	Inferior
G	9 years, 5 months	50th	Average
H	10 years	15th	Inferior
I	10 years	below norms	Inferior
J	9 years	40th	Average

itself is that the addition of the visual element simplified the task somewhat for the subjects who obtained the "average" socres, but complicated the task for the other subjects. It could be, for example, that the visual element served to focus the attention of Subjects B, D, and J, whereas the other subjects were not able to integrate the two with any measure of success.

Another possibility is that the subjects who scored in the "inferior" range were particularly weak in auditory sequencing.

Finally, the fact that this was administered as a group test should not be overlooked. The writer administered the test to the group as a whole. The classroom teacher and one other clinician were available to help the subjects interpret and follow the directions. The test was administered in September, the beginning of the school year. The teacher, the writer and the clinician were all struck by the restlessness of the subjects, which made for a less than ideal noise level in the room. In addition, many subjects seemed to have difficulty concentrating in the group situation.

The differences in the nature of the Wepman Auditory Discrimination Test and the Monroe-Sherman subtest are worth noting. The Wepman test is administered individually and neither sequencing nor a visual element is involved (not even lip reading, since the subject does not face the exam-

iner). Furthermore, all words used in the Wepman test (except for one pair) are words of one syllable, whereas in the Monroe-Sherman words of two syllables or more are frequently used.

Therefore, the inferior scores obtained on this subtest could have been due to a variety of factors in the nature of the task and in the testing situation. They cannot be attributed to poor auditory discrimination alone.

Fast-Cosens Auditory Discrimination Test

The Fast-Cosens Auditory Discrimination Test was administered to the ten subjects. Their performance on the test will be discussed as follows:

i) the distribution of the total

ii) the patterns of difficulty that emerged for the group as a whole for specific sound contrasts;

iii) the patterns of difficulty that emerged for the group as a whole for sounds in initial, medial and final positions;

iv) the patterns of difficulty that emerged for the group as a whole for voiced and voiceless sounds;

v) the performance of the group on items that contained like,and items that contained unlike pairs of words.

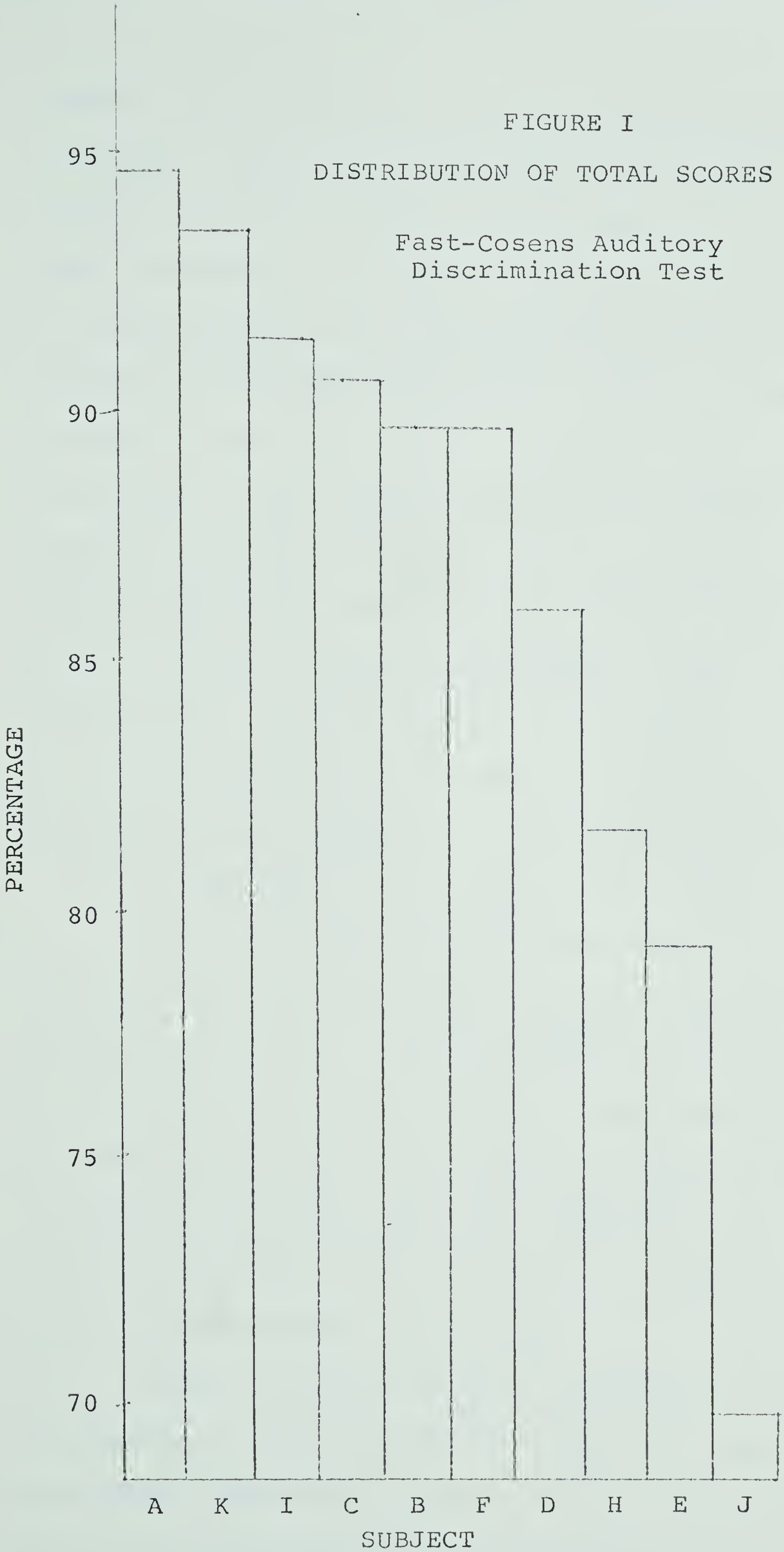
i) Distribution of Total Scores on the Fast-Cosens Auditory Discrimination Scores:

Figure 1 shows the distribution of total scores (in percentages) for the group as a whole. The distribution

FIGURE I

DISTRIBUTION OF TOTAL SCORES

Fast-Cosens Auditory Discrimination Test



suggests that performance was on a high level for most of the group. There was a very wide gap between the score of Subject J and the subject who obtained the next lowest score (Subject E). Subject J was one of the oldest members of the group,and he had the lowest intelligence rating. Subjects E and H,who obtained the lowest ratings after Subject J, were the only two subjects in the group who were considered to have speech articulation problems severe enough to warrant therapy at the time they started school. Subject H was also older than most of the others in the group. Neither Subject H nor Subject E had articulation difficulties at the time when this study was conducted--but it is possible that their relative weakness in auditory discrimination was a residual of their earlier difficulties.

ii) Performance of the Group on Specific Sound Types

The performance of the group was examined in relation to the types of sound contrasts involved in the unlike pairs of words. The percentage of correct responses in relation to the total number of such sound types in the test was computed for the group as a whole. Since Subject I scored so far below the other subjects in the group the average percentages were calculated, excluding his score and he was considered separately.

Table 10 shows that for the group as a whole (without Subject J) the averages for each sound type were high and ranged from 86.86 per cent to 91.25 per cent. The easiest sound contrasts to discriminate for this group were

fricative-affricate followed by semivowel-lateral contrasts; then ficative-fricative comparisons. The most difficult were the nasals followed by the stop-fricative contrasts and then the stops. However, interpretation of the words "easiest" and "most difficult" must be made in the context of the narrow range of scores from 86.86 per cent to 91.25 per cent.

TABLE 10

AVERAGE PERCENTAGE SCORES OF THE NINE SUBJECTS ON TEST SCORES GROUPED ACCORDING TO SOUND CONTRASTS

Stops	87.76%
Nasals	86.86%
Semivowel - Lateral .	90.90%
Fricatives	89.97%
Affricate-Fricative .	94.44%
Stop-Fricative . . .	86.94%

It was felt that Subject I should be considered separately, since his scores deviated so markedly from the scores of the other subjects on this test. His percentage scores ranged from 18.18 to 62.5. His highest score was lower than the lowest percentage scores obtained by any other subject on any of the groups of sound contrasts. This subject was away ill on the day when this test was administered to the group. The writer returned subsequently and the test was administered to this subject individually.

Nevertheless, it was noticed that his attention wandered constantly and he had to be given more breaks than were given to the other subjects. The results obtained for this subject, therefore, are of dubious validity as regards his ability to discriminate between speech sounds. As an illustration of the way in which this subject performed on a task which required his attention over a period of time, his results are of value. His results are listed in Table 11. Like the rest of the group as a whole, he found the affricate-fricatives easiest to discriminate. Like the rest of the group (taken as a whole) he found nasals the most difficult to discriminate. Unlike the rest of the group, he found semivowel-laterals the second most difficult group to discriminate followed by stop-fricatives.

TABLE 11

SUBJECT I

TEST SCORES GROUPED ACCORDING TO SOUND CONTRASTS
(in percentages)

Stops	43.37%
Nasals	18.18%
Semivowel-Lateral	36.36%
Fricatives	50.00%
Affricate-Fricative . . .	62.5 %
Stop-Fricative	41.66%

iii) Voiced and Voiceless Sounds

The performance of the group was examined in relation to voiced and voiceless sounds. Table 12 shows the percentage of voiced and voiceless sounds that were correctly discriminated by each subject. It shows that 90 per cent of the subjects found the voiceless sounds easier to discriminate than the voiced. One subject (E) had greater difficulty with the voiced as opposed to the voiceless sound types.

iv) Sounds in Initial, Medial and Final Positions:

The percentages of correct disciminations of sounds in initial, medial and final positions in contrasting words were calculated for each subject. Table 13 shows these percentages. In this group, six subjects found the medial sounds the easiest to discriminate; three found initial sounds easiest to discriminate and one found the final sounds the easiest to discriminate.

Four subjects found the final sound the most difficult to discriminate, while three found the initial and three the medial sounds the most difficult to discriminate.

When the average percentages were calculated for each type of sound, it was found that the final sounds were the most difficult to discriminate for the group as a whole. The second most difficult were the initial sounds and the medial sounds were the easiest for the group as a whole. However, the range of scores is very small--84.58 per cent for the

TABLE 12

PER CENT OF VOICED AND VOICELESS SOUNDS
CORRECTLY DISCRIMINATED

Subject	Voiceless	Voiced
A	98.52	88.37
B	94.11	83.72
C	91.17	88.37
D	88.23	83.72
E	83.82	95.34
F	95.58	90.69
G	88.23	60.46
H	95.58	86.04
I	57.47	37.20
J	94.11	90.69
Range:	51.47-98.52	37.20-95.34
Average:	88.82	80.46

TABLE 13

PERCENTAGE OF CORRECT DISCRIMINATIONS AMONG SOUNDS IN INITIAL, MEDIAL AND FINAL POSITIONS

Subject	Initial	Medial	Final
A	87.17	96.96	93.44
B	92.3	96.96	88.52
C	84.6	90.0	95.08
D	87.17	93.93	85.24
E	87.17	90.7	85.24
F	94.87	87.87	91.8
G	82.05	72.72	78.68
H	89.74	93.93	91.8
I	51.28	36.36	42.62
J	92.3	96.96	93.44

final sounds,84.86 per cent for the initial sounds and 85.72 per cent for medial sounds. Again, the percentage scores of one subject (I) were much lower than those of any other subject in the group.

v) Like and Unlike Word Pairs:

The average number of errors made by the group as a whole on like pairs of words was 19.1 and the average number made on unlike pairs of words by the group as a whole was 19.9. The averages were computed twice--once with Subject I's score included in the total (as above) and once without. Without Subject I's totals the figures were quite different. The average number of errors made on like pairs of words then was 17.2 and the average number of errors made on unlike pairs of words was 14.0. This difference in favour of the like pairs of words (i.e., the subjects made more errors on like pairs of words) is not large--and is contrary to the finding by Cosens (1968) on a group of Grade I children using this test. She found that the subjects in her study found hearing similarities in speech sounds in words an easier discriminatory task than hearing differences. She felt that attention did influence the results.

Undoubtedly attention factors did influence these results. The subjects all needed more than one break during the administration of the test. They needed constant reminders of what they were to do if the words they heard were

the same and what to do if the words they heard were different. Some of them seemed to have difficulty holding these ideas in mind during the duration of the test. Some would fall into a pattern of doing one action or the other automatically for a period of time and the pattern would have to be interrupted by a complete break. The value of this test, therefore, with a clinical sample such as this group, could be questioned.

However, it could be argued that the effects of inattention were partially mitigated by the breaks that were given the subjects.

An examination of the scores of individual subjects shows that four of the subjects had a greater number of errors on the unlike pairs than on the like pairs. Four had a greater number of errors on the like pairs than on the unlike pairs and two had an equal number of errors on both.

In 1967 Johnson and Myklebust stated when describing the auditory perceptual difficulties of the auditory dyslexic:

> "One of the most common is the inability to 'hear' the similarities in initial or final sounds in words. The child does not perceive the similarities in the words 'boy' and 'big' or the final sounds of 'mat' and 'cat'" (p.174).

It seems that these subjects had some difficulty in perceiving the similarities in pairs of words. How much of this was a true auditory perceptual difficulty and how much was due to the nature of the test and the short attention

span of some of the subjects is difficult to say.

Auditory Blending

The ability to blend sounds heard into a word is measured using two tests.

1. Firstly, a subtest of the Illinois Test of Psycholinquistic Abilities (I.T.P.A.) "Sound Blending" was used. On the I.T.P.A. test, each subject showed wide discrepancies between the subtests. All the subjects in this group, however, scored at the ten year old level or over on the subtest of auditory blending. For all the subjects their score on this subtest of the I.T.P.A. was the highest point on their profile. Some had similar scores for other subtests, but none had higher scores.

This indicates that by the time these subjects entered the "dyslexic" class they did not have difficulty with auditory blending as measured in this test.

Since difficulty with blending is described as a characteristic of dyslexia these subjects' high scores in this area should be examined further.

Firstly, this test does not contain a visual component. It simply examines the subject's ability to blend sounds heard auditorily into whole words. It is not dependent at all on the child's ability to associate sounds with symbols and then blend them into words. It may be precisely at this point (when integration is required) that these children experienced difficulty.

It has been noted that all these subjects had trouble in learning to read satisfactorily from the beginning of their school career. They had all been referred to a reading specialist for diagnostic work and help. It is possible that any difficulty in this area which they were experiencing would have been noticed early and specific directions given to the teacher to help remediate this difficulty. However, a test of auditory blending ability is not regularly given to students who are referred for diagnostic work (perhaps because of the unsatisfactory nature of the few tests available in this area) and, therefore, the development of this ability could not be traced in the files of all these subjects. In only three cases (Subjects I, B, J) was specific mention made by the Clinic classroom teacher of major difficulties in blending and specific recommendations to overcome these--and difficulties in blending were noted in a reading situation rather than a purely auditory situation.

2. The Roswell-Chall Auditory Blending Test was administered to these subjects, too. The total scores obtained by these students are listed in Table 14. It shows that all the subjects had adequate blending ability as measured on this test.

Auditory Memory

The auditory memory of these subjects was checked using a number of measures.

TABLE 14

SCORES OBTAINED ON THE ROSWELL-CHALL TEST OF AUDITORY BLENDING

Subject	Total Score	Chronological Age	Rating
A	22/30	8.11 years	Adequate
B	29/30	9.9 years	Adequate
C	26/30	8.8 years	Adequate
D	30/30	9.5 years	Adequate
E	27/30	8.8 years	Adequate
F	23/30	9.2 years	Adequate
G	25/30	9.5 years	Adequate
H	29/30	10.0 years	Adequate
I	19/30	10.0 years	Adequate
J	26/30	9.0 years	Adequate

Monroe-Sherman Reading Achievement and Aptitude Test: Subtest of Letter Memory

In the auditory aptitude test of letter memory, the subjects were required to listen to a series of letters named by the tester and then to write down the letters they had heard. This test requires the ability to remember a series of letters in correct sequence and then to translate them into their visual equivalents.

The score obtained by each subject was translated into a percentile as compared to chronological age. As in the test of "Orientation and Discrimination" the percentiles obtained by the subjects were rated, according to the norms

provided, as "superior," "average," or "inferior." Table 15 shows the results obtained on this test.

TABLE 15

RESULTS OBTAINED ON MONROE-SHERMAN APTITUDE TEST: AUDITORY LETTER MEMORY

Subject	Chronological Age	Percentile	Rating
A	8.11 years	below norms	Inferior
B	9.9 years	10th	Inferior
C	8.8 years	below norms	Inferior
D	9.5 years	below norms	Inferior
E	8.8 years	below norms	Inferior
F	9.2 years	below norms	Inferior
G	9.5 years	below norms	Inferior
H	10.0 years	below norms	Inferior
I	10.0 years	below norms	Inferior
J	9.0 years	10th	Inferior

All the subjects obtained an "inferior" rating and eight scored below the norms for their age group. Performance on this test, for the group as a whole, therefore, was extremely poor. It has been pointed out, however, that factors in addition to auditory memory are part of this test, viz., an ability to keep a sequence in mind and translate it into visual equivalents. It is difficult to evaluate the aspects of the task influencing the performance of the subjects more than others. However, auditory memory

is involved in successful completion of the task and these subjects were particularly weak in the performance of the task.

2. Illinois Test of Psycholinguistic Abilities: Auditory Sequential Memory Subtests

The raw score obtained by each subject on this subtest was converted to an age equivalent score using the norms provided in the Examiner's Manual of the I.T.P.A.

Table 16 shows that all the subjects except two

TALBE 16

RESULTS OF THE I.T.P.A. SUBTEST "AUDITORY SEQUENTIAL MEMORY"

Subject	Chronological Age	Psycholinguistic (Age Equivalent)	Retardation
A	8.11	5.3	3.8 years
B	9.9	10.5	
C	8.8	7.2	1.6 years
D	9.5	4.8	4.7 years
E	8.8	9.2	
F	9.2	5.8	3.4 years
G	9.5	8.4	1.1 years
H	10.0	6.8	3.2 years
I	10.0	8.3	1.7 years
J	9.0	6.8	2.2 years

scored below chronological age on this subtest and the amount of retardation as shown by this test was considerable,

ranging from 1.1 - 4.7 years. Subject B scored at the 10.5 year old level on this subtest (his chronological age was 9.9 years). His profile on the whole test was generally at, or above chronological age. For Subject E, the score obtained on auditory sequential memory was one of the highest on his profile--in an individual testing situation he was able to perform well in a task that required auditory sequential memory.

3. Memory for Digits and Letters

These tests required the subjects to listen while the examiner said a number of letters or digits in sequence, and then to repeat them in the same sequence. There were two tests for digits (one in which the subject was required to repeat the letters in the same sequence, and one in which he was required to repeat them in reverse order) and two tests for letters. The "span" score on each test was the number of individual units in the largest sequence correctly repeated.

Table 17 shows the scores on each of the four tests for each subject. For the group as a whole the highest average score was the "Digits Forward" test, while the lowest average score was for the "Letters Backward" test. For every subject the score on the "forward test" (digits and letters) was higher than the score on the "backward test."

TABLE 17

RESULTS: MEMORY FOR DIGITS AND LETTERS

Subject	Letters Forward	Letters Backward	Digits Forward	Digits Backwards	Chronological Age
A	5	2	4	2	8.11
B	4	2	4	2	9.9
C	5	2	4	2	8.8
D	3	2	3	2	9.5
E	5	3	5	3	8.8
F	4	2	4	2	9.2
G	4	2	6	3	9.5
H	3	2	4	3	10.0
I	3	2	4	2	10.0
J	4	2	4	2	9.0
Average	4	2.1	4.2	2.4	9.38

These tests were devised and used by Rodgers (1968) with a group of fifty retarded underachieving readers and competent achieving readers in Grade II, with average I.Q.'s. Their mean age was 9.8 years and the average chronological age of the ten subjects in this group was 9.38. The mean score for his retarded readers on the Letters Forward subtest was 2.55, for the competent readers 3.94. The average score for the group in this study on the Letters Forward subtest was 4.0--slightly higher than both groups mentioned above. However, there was a difference of one and one-half

years in the average age of the subjects used in this study and the subjects used in the Rodgers' study. This could be taken as evidence that the subjects in this study were operating at a level equivalent to that of younger subjects, on this particular subtest. The average scores obtained by the subjects in this study on the Letters Backward, Digits Forward and Digits Backward tests were all lower than the mean scores obtained by both the Grade II retarded underachieving readers and competent achieving readers in the Rodgers' study. This could be taken as evidence that these subjects, on these tests, were operating at a level that would be found in students more than one and one-half years younger than they were.

4. Detroit Tests of Learning Aptitudes: Memory for Unrelated Words

From the Detroit Tests of Learning Aptitudes the memory test for unrelated words was used. The score obtained on this test was converted to a "Simple Score" using the norms provided in the test manual. This score is given as an age equivalent.

Table 18 shows that none of the subjects obtained a score equivalent to his chronological age on this test, although one subject (J) came close to doing so. The retardation ranged from 4 to 5.7 years. It must be pointed out that in this test credit is given for every item correctly remembered regardless of the sequence in which this item is remembered. It was noticed in the performance of these

subjects that frequently the memory of an item would persist beyond the time spent on the particular sequence to which it belonged and the subject would continue to name it in connection with the new sequence being dealt with. It seemed almost as if the memory of that item was interfering with the recall of the new items being dealt with. It is difficult to interpret this phenomenon--was it a form of perseveration? Did these subjects have particular difficulty "shifting" from one task to another?

TABLE 18

RESULTS: MEMORY FOR UNRELATED WORDS

Subject	Chronological Age	Age Equivalent
A	8.11 years	7.6 years
B	9.9 years	7.0 years
C	8.8 years	6.9 years
D	9.5 years	6.3 years
E	8.8 years	6.0 years
F	9.2 years	4.9 years
G	9.5 years	6.6 years
H	10.0 years	4.3 years
I	10.0 years	5.0 years
J	9.0 years	8.6 years

From time to time a subject would say a word that he had been unable to recall with a previous group of items, with a subsequent group to which it did not belong. Were

these evidences of "delayed response"?

These phenomena were not noticed with the memory tests that dealt with letters and digits. It is possible that performance on this test, then, was influenced by the language facility of each subject, as well as by his auditory memory.

Individual and Group Patterns of Performance on the Tests of Auditory Perception

In this section, the performance of each subject on the auditory perceptual tests will be examined to determine patterns of relative strengths and weaknesses. Since the results of the various tests were reported in a number of different ways (e.g., raw scores, age equivalents, percentiles) the error scores on the various tests were converted to percentages of total scores for purposes of comparison. Bar graphs were constructed for each subject showing the percentage of error for each auditory perceptual test. Since two scores were available for the *Wepman Auditory Discrimination Test* for some of the subjects, and three scores for other subjects, only two scores were plotted for each subject--the score obtained on the first administration of the test, and the score obtained in the last administration of the test. Two subtests from the *Illinois Test of Psycholinguistic Abilities* were used in this study (Auditory Blending, Auditory Sequential Memory). Since the chief value of the test profile obtained by the

subject and since they were discussed in this way in this study, the results were not included in the bar graphs.

The bar graphs for each subject are shown in Figures 2 - 11 in Appendix B. An examination of the bar graphs and of the results obtained on individual tests for each subject shows that the following patterns of perceptual ability emerged for the group as a whole:

1. On the Wepman Auditory Discrimination Test administered at the beginning of this study, only one subject showed inadequate development, as compared to chronological age, in auditory discrimination.

2. An examination of the files of these subjects indicated that all subjects except one had shown inadequate auditory discrimination, as measured on this test, in their earlier school careers.

3. These results seem to confirm the developmental nature of auditory discrimination and an immaturity in this aptitude for these children when they entered school.

4. On an auditory discrimination task that combined visual and auditory requirements the majority of these subjects obtained a percentile rank that was classified as "inferior."

5. On the Fast-Cosens Auditory Discrimination Test, general performance was high for the group as a whole. The easiest sound contrasts for the group as a whole were fricative-affricate, followed by semivowel-laterals. The most difficult were nasals followed by stop-fricatives and

then stops. Voiced sounds were more difficult than voiceless and sounds in the final position were the most difficult to discriminate followed by sounds in the initial position. Medial sounds were the easiest to discriminate. Finally, this group as a whole found it more difficult to hear similarities rather than differences in words.

6. When the percentage of errors on the auditory discrimination, auditory blending and auditory memory tests were compared, all the subjects showed strength in auditory discrimination and auditory blending and great weakness in auditory memory.

7. The bar graphs show that there was a wide discrepancy between their performance on the auditory discrimination and auditory blending tests on the one hand, and their performance on the auditory memory tests on the other hand. This was true for all subjects except one; Subject I's percentage of errors on the auditory discrimination tests were closer to his percentage of errors on the auditory memory tests than to his percentage of errors on the auditory blending test.

8. Within the auditory discrimination tests, all subjects scored the highest percentage of errors on the Monroe Sherman Test of Orientation and Discrimination (when the first administration of the Wepman was not considered). This could be due to differences in the nature of the task required and the method of administration of this test:

a) Firstly, the test was administered as a group test.

b) Then, in addition to close attention to small differences in words, the subject was required to remember the position, in a short sequence, of the chosen word and relate that to a visual sequence of symbols.

It could be that the memory factor, the concentration, and the integration required to perform this task successfully were the vital factors in the performance on this test--and the factors that differentiated the performance of the subjects on this test from their performance on other tests of auditory discrimination.

9. Within the auditory memory tests, all subjects had the lowest percentage of errors on the test of memory for unrelated words.

There is one obvious difference between this test and the other tests of auditory memory used, namely, this test used words, while all the other tests of auditory memory used letters or digits. It could be that the words were more meaningful for these subjects and that the meaning factor made for the difference in performance.

However, there is one other factor that could account for the relative ease of this test as compared to the other tests of auditory memory. This test requires, for successful performance, only that the subject repeat

the words--he is credited with successful performance regardless of the sequence in which the words are repeated. In all the other tests the letters or digits had to be repeated in the same sequence. It could be that recall in sequence is the difficult task for these subjects. This would accord with the findings of Doehring (1968) and Johnson and Myklebust (1965) that dyslexic children have difficulty with sequencing memory.

10. Within the tests of auditory memory, five subjects showed greatest weakness in the tests of auditory memory that required a written response. The same considerations used in evaluating performance on the Monroe-Sherman test of Orientation and Discrimination, apply here. In other words, the facts that the Monroe-Sherman test was administered as a group test, that it required the subjects to hold a sequence in mind and then to write that sequence, could be the crucial facts that account for the difficulty the subjects experienced in this test.

11. Within the group of auditory memory tests, all subjects showed greater difficulty on the tests of memory for digits and numbers backwards than on the tests of memory for digits and letters forward. It seems that for these subjects, holding a heard sequence in mind, and then reporting it in reverse order was a more demanding task than simply repeating the sequence in the order heard.

12. When a comparison was made between the percentage of errors made on the tests of letters and digits forward,

three subjects (Subjects B, E, F) showed no difference as between their performance on the tests. Three of the subjects (A, C, D) had a higher percentage of errors on the test of digits forward than on the test of letters forward, and four of the subjects (G, H, I, J) had a higher percentage of errors on the test of letters forward than on the test of digits forward. It is difficult to make any generalization on this particular group of results--patterns seem idiosyncratic.

13. All subjects showed wide variations in percentage of errors made on the tests--not only as between groups of tests (i.e., between tests of auditory discrimination, auditory blending) but also within groups of tests.

Summary of the Findings: Auditory Perception

In auditory perception the pattern of performance that emerged for the group as a whole was one of relative strength in auditory discrimination and auditory blending and relative weakness in auditory memory. Within the auditory discrimination tests, the majority of subjects showed weakness in this aptitude earlier in their school careers. Furthermore, the subjects were weakest on the auditory discrimination test that required them to hold a sequence in mind while performing an operation. Similarly, within the auditory memory tests, the group as a whole showed the greatest weakness on the tests that required them to hold a sequence in mind while performing an operation.

CHAPTER V

FINDINGS: ORAL READING

This chapter will examine the data obtained from the analysis of the oral reading miscues of the ten subjects using Goodman's Taxonomy (K. Goodman, 1969). The miscues analyzed were those made by the subjects during the testing sessions in each of the months of December 1969, January, February and March 1970. First, the performance of the whole group will be analyzed in relation to their reading of list words and words in the story. Then, the performance of the whole group in relation to each category of the taxonomy will be analyzed to determine what characteristics were common to most of the subjects and to determine whether there was any change in the reading behaviour of the group during the period of the study. The performance of individual subjects will be analyzed to determine any particular patterns of reading behaviour that resembled or differed from any group patterns. Finally, patterns of oral reading performance that emerged for the group in relation to the integration of grapho-phonic, syntactic and semantic information, will be examined. The categories are discussed in the order in which they appear in K. Goodman's taxonomy (1969).

I. Performance of the Group on Words in Lists and in Stories

One aspect of this study was to examine the relative ability of these ten boys to recognize words in the lists and to recognize the same words in stories. This aspect was not part of Goodman's taxonomy.

Table 19 shows the percentage of errors made by each subject on the list and the stories for each month and the ratio of list errors to story errors.

In December, eight of the subjects (A, B, D, E, G, H, I, J) read more words correctly on the list than in the stories. The ratio varied: Subjects A, G, I, J, had less than twice as many errors in the story than on the list. The ratio for subjects B, D, E, H, varied from twice to five times as many errors in the story as on the list. Only one of the subjects (F) read more words correctly in the story than on the list and one subject had the same number of errors on the list and in the story.

In January, seven of the subjects (B, C, D, E, F, G, I) read more words correctly on the list than in the stories. This time, there was less variation in the ratio of words read correctly in the lists to words read correctly in the story. Only two subjects read twice as many words correctly on the list as in the story (D and G) and only one subject (H) read twice as many words correctly in the story as on the list.

In February and in March the number of subjects who

TABLE 19

PERCENTAGE OF WORDS MISSED IN LIST AND STORY

	DECEMBER			JANUARY			FEBRUARY			MARCH		
Subject	List	Story	Ratio	List	Story	Ratio	List	Story	Ratio	List	Story	Ratio
A	23	26.6	1:1.15	23.3	13.3	1.75:1	12.5	12.5	1:1	10	10	1:1
B	15	30	1:2	20	36.6	1:1.83	22.5	10.0	2.25:1	35	27.7	1.26:1
C	23.3	23.3	1:1	40	46.6	1:1.65	16	30	1:1.25	20	35	1:1.75
D	6.6	36.6	1:5.54	15	45	1:3	25	45	1:1.8	23	43	1:1.86
E	5	15	1:3	15	10	1:5:1	40	25	1.6:1	43	36	1.19:1
F	20	10	2:1	30	33.3	1:1.1	22.5	17.5	1.25:1	20	15	1.3:1
G	26.6	30	1:1.27	8.7	20	1:2.29	12.5	17.5	1:1.4	10	20	1:2
H	3.3	16.6	1:5.03	30	15	2:1	20	20	1:1	10	10	1:1
I	45	60	1:1.33	30	40	1:1.33	35	35	1:1	50	60	1:1.20
J	13.6	16.6	1:1.22	50	35	1.42:1	25	30	1:1.2	20	6.7	2.98:1

read more words correctly on the list than in the story had dropped to four. In February three other subjects read the same number of words correctly on the list and in the story and in March two subjects performed in this way. The widest variation in ratios appeared in the first testing session when the ratio of words missed in the list and in the story varied from 1:1.15 to 1:5.54. By January the range had narrowed from 1:1.1 to 1:3; in February the range was 1:1.25 to 1:1.8 and in March the range was 1:1.19 to 1:2.

The number of subjects who read more words correctly in the story than on the list fluctuated from month to month. In December, only one subject showed this behaviour (Subject F) and he read twice as many words correctly in the story than on the list. In January, four subjects read more words correctly in the story than on the list (A, E, H, J), although only one of them read twice as many words correctly in the story as on the list. In February, three subjects performed in this way (B, E, F), and again, only one read twice as many words correctly in the story as on the list. In March, too, four subjects read more words correctly in the story than on the list (B, E, F, J) and one reached the ratio of 2:1.

Summary: Identification of Words in Lists and in Stories

In most cases, the differences between the percentage of words missed on the list and in the story is small

and it is doubtful that any firm conclusion can be drawn from the figures obtained. However, for the total group, the trend from December to March could be interpreted as a trend toward a more efficient use of all language cues available while reading so that words that could not be identified in isolation, could be identified in context. This trend can be discerned from the following observations:

a) eight subjects read more words correctly in the list than in the story in December; by March only four subjects read more words correctly in the list than in the story;

b) in December the range in the ratio of words missed in the list to words missed in the story was 1:1.15 - 1:5.54. By March, the range in the ratio of words missed in the list to words missed in the story had narrowed to 1:1.19 - 1:2;

c) in December, only one subject read more words correctly in the story than in the list; in January, four subjects showed this behaviour and the ratio of words missed in the list to words missed in the story ranged from 1.42:1 to 2:1. In February, three subjects performed in this way and the ratio ranged from 1.25:1 - 2.25:1. In March, four subjects read more words correctly in the story than in the list and the ratio of words missed in the list to words missed in the story ranged from 1.26:1 - 2.98:1.

However, the evidence available from the detailed

analysis of miscues, does not confirm this as a trend. Over a longer period of time it might have been possible to determine whether this was a firm trend toward more efficient use of all the language cues in reading.

II. <u>Miscues Per Hundred Words</u> - This is the first category of the taxonomy.

The number of miscues for each subject for each month was calculated and the number of miscues per hundred words (m.p.h.w.) read was computed. The average number of miscues for the whole group for each month was computed.

Table 20 shows the number of miscues per hundred words for each subject for each session and the average number of miscues per hundred words for the whole group for each session.

TABLE 20

NUMBER OF MISCUES PER HUNDRED WORDS

Subject	December	January	February	March
A	16.11	11.20	9.22	10.45
B	23.25	19.66	14.98	21.12
C	10.00	20.45	11.72	17.25
D	21.11	27.17	21.53	23.28
E	18.88	19.02	20.28	20.56
F	5.37	11.78	14.40	8.76
G	18.88	13.03	9.66	16.84
H	8.33	7.66	7.84	7.94
I	29.05	25.48	25.0	24.07
J	13.04	14.44	7.52	7.74
Average	16.5	16.99	14.21	15.032

Only two subjects showed a drop in the number of miscues per hundred words from session to session (H, I). The range of m.p.h.w. for the four sessions differed widely from subject to subject. Subjects H and E showed the smallest ranges (.67 and 1.68 respectively). For these two subjects the m.p.h.w. fluctuated very little. Subject H read increasingly more difficult material (according to the placement of stories in the readers) from session to session. Subject E read material of increasing difficulty (using the same criterion) within a session, but started off each session with a story of similar difficulty to the last story read at the previous session. Thus, for Subjects H and E the small fluctuations in the number of m.p.h.w. from session to session is evidence that they were reading more difficult material with comparable proficiency at each session.

Subject A had a range of 9.22 - 16.11 m.p.h.w. over all the sessions. His highest number of m.p.h.w. was in December when he read the easiest stories (as placed in the series of readers). He showed a steady drop in the m.p.h.w. he made in January and February although he read stories of increasing length and difficulty. The number of m.p.h.w. he made in March was slightly higher than in February. In that month he read one story of comparable difficulty to the stories read in February and one more difficult story. The gradual increase in the m.p.h.w.

with more difficult stories from February to March is evidence that Subject A was reading more difficult material with comparable proficiency at these two sessions. The decrease in the m.p.h.w. from December to January and from January to February while he read more difficult stories seems to indicate that he was reading more difficult material with increased proficiency.

Subject B had a range of 14.98 - 23.25 m.p.h.w. over all the sessions. Between December and January he showed a drop of 3.59 m.p.h.w. In January, he read material of comparable difficulty and the drop in the number of miscues per hundred words seems to indicate that from December to January he read material of comparable difficulty with increased efficiency. He showed a drop of 4.68 m.p.h.w. between the January and February sessions. Again, he read more difficult and longer stories and the drop in the m.p.h.w. seems to be evidence that he was reading with greater proficiency. However, this subject showed an increase of 6.14 m.p.h.w. between February and March--despite the fact that the stories he read in March were only slightly more difficult than those he read in February (again, judged by their placement in the reader). Subject B had a very heavy cold and was obviously very tired during the March testing session. Therefore, it is possible that his performance during the March session was not as efficient as it could have been.

Subject C had the lowest m.p.h.w. in December when he read the shortest and easiest stories (as placed in the reader). He had an increase of 10.45 m.p.h.w from December to January. In January he was given stories only slightly more difficult than those he read in December. He seemed to be reading less efficiently than he read in December. The January session took place shortly after the Christmas holidays and it is possible that for this subject the increased number of m.p.h.w. was influenced by the holiday period. By February, Subject C was making a number of m.p.h.w. similar to the number he made in December. However, in February, he read material more difficult than that read in January or December indicating that he was reading more difficult material with similar or better proficiency. However, this subject's m.p.h.w. increased again in March, although the material he read was similar in difficulty to that read in February. For this subject, factors other than the difficulty of the materials (as indicated by their placement in the book) influenced the number of miscues he made while reading.

Subject D had a large number of m.p.h.w. in the December session. These increased by 6.06 m.p.h.w. in January. In December he had read the last story of Book A of the "Basic Reading" series. He was not reading the two stories with comparable efficiency. This boy

too, could have been affected adversely by the holiday period. In February, Subject D was given stories from the second reader of the series again--these stories followed immediately on the previous reading material and presumably were either of equal difficulty or slightly more difficult. From January to February his m.p.h.w. decreased by 5.64 and almost equalled the number he made in December. He was, therefore, reading more difficult material in February than in December with comparable efficiency. In March the m.p.h.w. he made showed an increase again (of 1.78). In March he read materials of comparable difficulty to those read in February. Factors other than the difficulty of the materials as indicated by their placement in the series seem to have affected the m.p.h.w. made by this boy.

Subject F made the fewest m.p.h.w. made by any subject in this study during the December session when he read the easiest stories. He showed his highest increase in m.p.h.w. from December to January, despite the fact that he was reading material of comparable difficulty to that read at the December session. This boy's reading, too, could have been affected by the Christmas break. From January to February he showed an increase of 2.62 m.p.h.w. In February he was reading material from the next reader in the series which seems to indicate that in February he was reading material of greater

difficulty than that read in January with at least equal efficiency. In March, this boy read the most difficult materials he had yet read in the sessions--with fewer m.p.h.w. than he had had in January or February. He seemed to be reading more difficult materials with greater efficiency and again factors other than the graded difficulty of the materials affected the m.p.h.w. he made.

Subject G showed great variability from session to session. He made the most m.p.h.w. in December when he read the easiest stories as graded in the reader series. He showed the greatest improvements in the number of m.p.h.w. (of 5.85) between December and January, despite the Christmas holidays and the increased difficulty of the story material. He continued to show an improvement in the number of m.p.h.w. in February (of 3.37) when the material presented was from the next reader in the series. However, in March he again showed an increase in the number of m.p.h.w. made. This time the story material was presented from the same book in the series. They were chosen from the second half of the book (the February stories were chosen from the earlier part of the book) and were presumably more difficult. Thus, for this boy, increased difficulty in story material from December to January and from January to February was accompanied by increased efficiency in reading. However, this pattern

was not maintained from the February to March session.

Subject I showed the highest number of miscues in December when he read the easiest stories. He showed his biggest improvement in m.p.h.w. (3.57) from December to January, despite the Christmas break. In January, he was reading story material at a comparable graded level to that read in December. He appeared, therefore, to be reading material of comparable difficulty with greater efficiency. In February, he showed a very slight decline in the number of m.p.h.w. using material from the next reader in the series. Again, he showed a slight decline in the m.p.h.w. made in March using material of comparable difficulty (i.e., a parallel reader in the series). This subject seemed to be reading more difficult material with better proficiency from the December to the March sessions. It should be noted that in March he was reading story material that the other subjects in the group had read at either the December or January sessions. The investigator attempted to give more difficult material in March than he had read in February. He was unable to cope with it and accordingly had to be given easier material to read.

Subject J was given increasingly more difficult material over the months. He had the most m.p.h.w. in December and January when he read the easier materials. He showed the greatest improvement in m.p.h.w. from Jan-

uary to February (6.92), although he read more difficult stories in February. He made almost the same number of m.p.h.w. in March while reading more difficult stories This subject seemed to be reading more difficult stories with greater efficiency from month to month.

Summary and Conclusions: Miscues per Hundred Words

1. The number of m.p.h.w. varied considerably from subject to subject in each month.

2. For most subjects, the number of m.p.h.w. varied from session to session. Two subjects only, showed very little fluctuation in the number of m.p.h.w. at each reading session.

3. No pattern emerged for the group as a whole. Four subjects made their greatest number of m.p.h.w. during the December session when they read the easiest material. Three subjects showed their greatest increase in the number of m.p.h.w. from December to January, following the Christmas holidays. However, three other subjects showed their greatest improvement in the m.p.h.w. they made over the same sessions.

4. The m.p.h.w. made by each subject seemed to increase or decrease from month to month regardless of whether the material presented followed immediately on the previous reading material, paralleled the previous reading material, or was from the next book in the graded series.

No patterns emerged.

5. When the number of m.p.h.w. made in December (the first session) was compared to the number made in March (the last session) it was found that six of the subjects made fewer m.p.h.w. in the last session than in the first. All six of the subjects were reading more difficult material (as judged by the placement of the story in the series) in March than they had read in December. These seven subjects therefore, seemed to be reading more difficult material with greater efficiency in March than in December (as judged by the m.p.h.w.).

One subject seemed to be reading more difficult material with comparable efficiency in March as compared to December. For the three other subjects, factors other than the difficulty of the materials (as indicated by their placement in the book) seemed to influence the m.p.h.w. made while reading.

III. Miscues Corrected

In this section of the taxonomy the attempt or lack of attempt at correction of each miscue was categorized. The following code was used:

1 - if the miscue was successfully corrected;

9 - if the miscue was corrected but the attempt was unsuccessful;

2 - if a correct response was abandoned for a miscue;

0 -- if no attempt was made to correct the miscue.

The totals for each subcategory were obtained for each subject for each month and the percentage of each subjcategory in relation to the total number of miscues made by each subject was computed.

Table 21 shows the results obtained in this category. The examination of the table will show that when an attempt at correction was made, it was successful in the vast majority of instances (82.5 per cent). In December, two subjects had a higher percentage of unsuccessful corrections than successful ones (C and G). In January, two of the subjects had a higher percentage of unsuccessful corrections (Subjects I, J) and in February and March only one subject (Subject E) showed this pattern.

Further analysis of the figures shows that with the majority of miscues (87.5 per cent) no attempt was made at correction. This remained the case throughout the period of this study, although for some subjects the percentage of miscues for which no correction was attempted showed great change and fluctuation. Thus, for six of the subjects (C, D, F, G, H, I) the percentage of miscues for which no attempt to correct was made increased from December to March and for one subject (J) the percentage remained about the same.

In very few instances was a correction made to change a correct response. An examination of the instances

TABLE 21

MISCUES CORRECTED (IN PERCENTAGES)

	Successfully Corrected				Unsuccessfully Corrected				No Attempt to Correct				Abandoned Correct Response			
Subject	D	J	F	M	D	J	F	M	D	J	F	M	D	J	F	M
A	13.79	15.00	31.15	29.41	6.89	10.00	2.18	15.68	79.32	72.50	46.88	54.91	0	2.50	0	0
B	20.40	21.42	43.63	35.00	8.16	4.28	9.09	15.00	71.44	38.30	45.47	50.00	0	0	1.81	0
C	11.11	6.25	24.52	20.58	38.88	4.68	9.43	0	50.80	89.07	66.05	79.42	0	0	0	0
D	37.50	21.73	29.50	15.25	10.00	13.04	13.11	6.77	50.00	65.23	55.76	77.98	2.50	0	1.63	0
E	18.18	18.91	15.00	17.74	0	18.91	20.00	20.96	81.82	59.48	63.34	58.08	0	2.70	1.66	3.22
F	42.85	22.50	23.52	23.07	28.57	2.50	13.72	1.79	28.58	75.00	60.80	56.43	0	0	1.96	2.56
G	35.29	23.86	26.66	15.78	41.17	14.77	8.88	13.15	23.54	61.37	65.12	71.07	0	0	0	0
H	40.00	50.00	35.71	11.11	0	5.55	14.28	4.44	60.00	44.45	50.01	84.45	0	0	0	0
I	15.15	10.16	16.66	10.52	18.18	16.94	0	7.89	66.67	72.90	83.34	81.59	0	0	0	0
J	21.73	3.12	17.85	20.83	0	14.06	14.28	4.16	78.27	82.82	67.87	75.01	0	0	0	0

in which this was done is revealing. Thus, e.g., Subject E in the March session, when reading the sentence:

"Ted went to Rags to get it"

first read:

"Ted wants to"

then regressed and read:

"Ted wants Rags to get it."

Thus he abandoned a correct response in order to read an acceptable sentence. Similarly, in January, the same subject read the sentence

"Is it far from Wags?"

as:

"Is it for farm Wags?"

then regressed and substituted "Wagons" for "Wags." Again, in relation to the previous miscue, the substitution of wagons for Wags was more acceptable.

In order to examine what factors influenced attempts at correction of miscues, a comparison was made of the number of m.p.h.w. and the percentage of miscues for which a correction was attempted by each subject, whether successfully or unsuccessfully.

Table 22 shows this comparison. No pattern emerges for the group as a whole. For six subjects their lowest m.p.h.w. was accompanied by the highest percentage miscues for which a correction was attempted although the

TABLE 22

A COMPARISON OF THE NUMBER OF M.P.H.W. AND THE PERCENTAGE OF MISCUES FOR WHICH A CORRECTION WAS ATTEMPTED

Subject	M.P.H.W. December	% Miscues Corrected	M.P.H.W. January	% Miscues Corrected (Attempted)	M.P.H.W. February	% Miscues Corrected (Attempted)	M.P.H.W. March	% Miscues Corrected (Attempted)
A	16.11	20.68	11.20	35.00	9.22	33.43	10.45	45.09
B	23.25	28.56	19.66	25.7	14.98	53.02	21.12	50.00
C	10.00	49.99	20.45	10.93	11.72	33.95	17.25	20.58
D	21.11	47.50	27.17	34.77	21.53	42.61	23.28	22.02
E	18.88	18.18	19.02	37.82	20.28	35.00	20.56	38.70
F	5.37	7.42	11.78	25.0	14.40	37.29	8.76	24.86
G	18.88	76.46	13.03	38.63	9.66	35.54	16.84	28.93
H	8.33	40.00	7.66	55.55	7.84	49.99	7.99	15.55
I	29.05	33.33	25.48	27.10	25.0	16.66	24.07	18.41
J	13.04	21.73	14.44	17.18	7.52	32.13	7.74	24.99

sessions during which this occurred varied from subject to subject. Thus subjects C, D and F showed this pattern in the December session. Subject H showed this pattern in January; subjects B and J showed the pattern in February and no subjects showed this pattern in March. Subject I had his lowest m.p.h.w. in March, but the highest percentage of attempts at correction in December when his m.p.h.w. were the highest. Subject E had his highest percentage attempts at correction of miscues in March when his m.p.h.w. were the highest; this same subject had the lowest percentage of attempted corrections in December when his m.p.h.w. were the highest. Subject G had the highest percentage of attempted corrections in the December session and the lowest percentage of attempted corrections in the March session. His lowest number of m.p.h.w. occurred in February.

Summary: Percentage of Miscues Corrected

1. When an attempt at correction of a miscue was made, it was successful in the vast majority of instances.

2. For the vast majority of miscues made over the four sessions, no attempt was made at correction. For seven of the subjects the percentage of miscues for which no attempt to correct was made fluctuated from month to month.

3. Factors other than m.p.h.w. influenced attempts at

correction. For six of the subjects, however, their lowest m.p.h.w. was accompanied by the highest percentage of attempts at correcting miscues. The number of m.p.h.w. made when this behaviour occurred varied from subject to subject as did the accompanying percentage attempts at correction. This is shown for the six subjects in Table 23.

TABLE 23

LOWEST NUMBER OF M.P.H.W. ACCOMPANIED BY HIGHEST PERCENTAGE ATTEMPTS AT CORRECTION FOR SIX SUBJECTS

Subject		M.P.H.W.	Percentage Attempts at Correction
	(C)	10.00	49.99
Dec.	(D)	21.11	47.50
	(F)	5.37	71.42
	(H)	7.66	55.55
Jan.	(J)	7.52	32.13
	(B)	14.98	53.02
Range		5.37 - 14.98	32.13 - 71.42

IV. Word - Phrase Identification

In this category of the taxonomy the instance at which the miscue was subsequently identified correctly was coded. The following code was used, (Y. Goodman, 1967):

1. Never - the subject never identified the word - phrase correctly in the story.

2. Correct Earlier - the subject had not made a miscue when he had encountered the same word previously within the story.

3. Very Next Encounter - the subject identified the miscued item successfully the very next time it occurred in the story.

4. Second Encounter - the subject identified the miscued item successfully the second time he encountered it after the miscue.

5. Third + Encounter - the subject identified the miscued item successfully the third, fourth, firth or nth time he encountered it after the miscue.

6. Inconsistent - the subject vacillated between correct and incorrect responses for the same item in the story.

7. Never Recurs - the miscued item did not recur in the same story.

It was found that in most of the stories used in this study, many of the items which were miscued did not recur again in the story. For the purposes of this category of the taxonomy, therefore, those miscued items which

did not recur were subtracted from the total number of miscues. The percentage for each subcategory (1 - 6) were calculated on those miscued items which did recur in the story.

Table 24 shows the instances at which miscues were identified during the reading of the material, shown as a percentage of the total number of miscues for each subject for each session.

1. Never Corrected

It shows that in December only one subject (I), as he read the story, never corrected more than half the miscues he made. The percentage of errors that were "never corrected" by the other subjects varied from 0 to 28.57 per cent. In January, the number of subjects who did not read half or more than half the miscued items correctly at some time in the story rose to five (Subjects A, B, C, D, I). For the others, the percentage of errors that were never corrected varied from 4.35 per cent to 45.71 per cent. In February only one subject did not identify correctly more than half the miscued items during the reading of the stories and for those who did identify more than half the miscued items correctly the percentage "never corrected" ranged from 0 to 48.00 per cent. In March, only two subjects did not identify correctly at some time in the story, more than half the miscued items. For those who did correct more than half the miscued items correctly in March the percentage of miscued items

TABLE 2

INSTANCES AT WHICH MISCUES IDENTIFIED

Subject	Never Corrected				Earlier				Very Next Encounter				Second Encounter				Third Encounter				Inconsistent			
	D	J	F	M	D	J	F	M	D	J	F	M	D	J	F	M	D	J	F	M	D	J	P	M
A	26.66	51.61	33.33	35.48	20.00	29.03	40.00	32.25	26.66	12.90	20.00	25.80	6.66	0	6.66	3.22	6.66	0	0	0	13.33	6.45	0	0
B	28.57	51.11	13.63	21.27	25.71	24.44	63.63	29.78	28.57	17.77	13.63	19.14	11.42	0	0	4.25	0	0	0	4.25	5.71	6.66	9.09	21.27
C	0	50.00	45.45	52.63	45.45	13.88	24.24	10.52	45.45	22.22	24.24	10.52	9.09	2.77	6.06	0	0	2.77	0	0	0	8.30	0	26.31
D	28.57	53.33	55.81	31.57	42.85	20.00	34.88	26.31	19.04	13.33	4.65	26.31	0	0	0	7.89	0	0	0	0	9.52	13.33	0	7.89
E	16.66	33.33	39.47	37.14	0	33.33	20.00	25.71	50.00	9.52	7.89	8.57	0	0	2.63	17.14	0	0	0	2.85	33.33	23.80	18.42	8.57
F	10.00	17.50	48.00	29.62	0	15.38	24.00	48.14	3.00	46.15	16.00	14.81	0	7.69	8.00	7.40	0	3.84	0	0	60.00	0	4.00	0
G	0	18.96	9.09	27.27	22.22	25.86	72.72	31.88	66.66	31.03	18.18	27.27	0	8.62	0	27.27	0	0	0	0	7.40	15.51	0	0
H	0	4.34	0	0	0	30.43	6.66	80.00	44.44	56.52	80.00	20	0	0	13.33	0	0	0	0	0	55.55	8.69	0	0
I	56.00	71.15	46.15	61.53	12.00	13.46	19.23	23.07	28.00	3.84	23.07	7.69	0	0	0	0	0	0	0	7.69	4.00	11.53	11.53	0
J	20.00	45.71	40.00	28.00	13.33	14.28	36.00	32.00	53.33	34.28	20.00	32.00	0	5.71	4.0	0	0	0	0	0	13.33	0	0	8.00

"never corrected"ranged from 21.27 per cent to 37.14 per cent.

2. Earlier

Once the subjects recognized a word in one context, there was no certainty that the word would be recognized in another context. The percentage of miscues for stimuli that had been identified correctly earlier in the reading of the story increased from December to March for eight of the subjects. For two of the subjects (C and D) the percentage of miscues for stimuli recognized earlier decreased.

It is frequently stated that dyslexic children will recognize words on one line that they will not recognize subsequently in the same story. This is often explained as a result of their inadequate visual discrimination and memory, particularly for the printed word, (Johnson and Myklebust, 1967). Miscues made by all subjects in this study in each month and coded in this subcategory seem to be due to this type of weakness; for example, Subject I in December read the story "Rags and Red." He read the name of the dog "Rags" correctly the first three times it appeared in the story. The fourth time it appeared he read the word as "Rug." He regressed and attempted to correct the miscue immediately, and read the word as "Rigs." He regressed again and attempted to correct it again and this time read the word as "Regs."

Similarly, Subject G, in December read the story "The Cats and the Cart." He identified the word "cart" correctly and immediately, the first four times it appeared. Then, at the sentence

"Tom is far from the cart"

he paused before the word "cart." He analyzed the word pronouncing the /ar/ phoneme as /er/ and read the word as "carrier." Next time the word "cart" appeared in the story, he analyzed it again, and this time read it as "c errot." He regressed and attempted to correct it immediately and read it as "c errier." In substituting "c errier" for "c errot" he seemed to be processing information from his previous reading and using it to correct a miscue that semantically was unacceptable. His substitution of "carrier" for "cart" the first time was acceptable syntactically; but what was noteworthy was his evident difficulty in recognizing a word that

a) he had recognized easily on previous instances in the story and that

b) followed acceptable syntactic and semantic patterns in the sentence.

In March, the same phenomenon was still apparent, for example, Subject J read the story "The Pink Swan." He read the word "swan" and "swans" correctly until he came to the sentence:

"Minks like to scare swans."

He read it:

"Mink like to scare "swens"

and immediately regressed and tried to correct "swens." This time, he read it as "swins"--he paused and then continued to read. Then, for the following sentence:

"But swans are too big for minks to eat."

he read:

"But swings are too big for minks to eat."

Similarly, Subject H in the story "The Deer and the Hunter" read the word "noble" without any hesitation in the sentence

". . . few animals in the forest have such noble horns as mine."

Subsequently, in the sentence

"I wish I had legs more worthy to carry such a noble crown of antlers."

he read the word "noble" as "numble."

On other occasions, the miscue that was substituted for the "known" word made little difference to the meaning of the material, e.g., "a" was substituted for "the;" or the miscue made sense in the immediate context; for example in the story "Flop Ears," which he read in March, Subject J read the sentence: "He sat down to chat with Tom" as "He said, 'Do not chat with Tom.'"

All the words in the phrase "sat down to" had been read correctly earlier in the story. It seemed that the miscue "said" for "sat" determined how he read the rest of

the sentence.

3. Very Next Encounter

For all subjects except one (Subject E in March), in all sessions, the largest percentage of identification of miscued items took place the very next time the item appeared in the reading material.

In most instances, however, a higher percentage of items miscued was never corrected in the story than was recognized the very next time, after the initial miscue, that the item appeared in the material.

4. Second, Third + Encounters

All subjects identified some miscued items the second, third or subsequent times they encountered them after the initial miscue. However, the percentage of instances when this occurred remained small for each session--it was less thatn 25 per cent at each session for all subjects except one (Subject G in March).

5. Inconsistently Recognized

All the subjects had instances of items that were sometimes read correctly, but at other times miscued, i.e., their performance each time the word was encountered was erratic.

Sometimes, whether the word was read correctly or miscued seemed to depend on what had just been read. E.g., Subject E, in the story "The Cats and the Cart" read the word "cats" erratically. In the title

"The Cats and the Cart"

he read the word "cats" correctly. Then he read the sentence

"the cats are at the cart"

as: "the carrots are at the carriage."

Later, for the sentences

"Can the cats harm the eggs?"

"The cats harm the eggs."

he read:

"Can the cats have the eggs and carrots, ham and eggs?"

He seemed to be attempting to process graphic and semantic information as he read. The miscue "have" for "harm" seemed to determine the way in which "cats" was read in the second line.

Similarly, Subject G in January, read the passage:

"Dale made a hit.
Dale ran fast to the base."

as: "Dale came to hit
Dale ran fast and hit the base."

and he read the sentence:

"Rick came to run."

This subject habitually associated <u>came</u> with <u>made</u>. Having miscued "made" he then read "a" as "to", seemingly to achieve a semantically acceptable sentence. On other occasions in the story, the function word "a" was read correctly by the subject.

Most of the items that were inconsistenly recog-

nized were short function words and made little difference to the general context.

Summary: Instance of Word - Phrase Identification

1. All subjects in this study identified some words correctly after miscuing the items initially.

2. When each subcategory was considered individually, in the majority of instances, the highest percentage of miscues were "never corrected" during the reading of the story. However, in a majority of instances, more than half the miscued items were correctly identified at some time during the reading of the story. In the January session, however, five subjects did not identify correctly half or more than half the miscued items.

3. When miscued items were subsequently recognized in the story, the highest percentage of recognition took place the very next time, after the initial miscue, that the word appeared in the reading material.

4. For all subjects a percentage of miscues had been read correctly previously in the story. The fact that the subject knew the word in one context did not mean that he would recognize the word subsequently. In many instances the failure in recognition seemed to be due to a memory defect rather than to an unusual or different use of the word in the story. In other instances, the miscue seemed to be the result of a previous miscue and an attempt to arrive at a semantically acceptable passage.

5. A smaller percentage of miscues were responses to stimuli that were inconsistently read. The majority of the words coded here were function words. The words substituted or omitted made little difference to the meaning of the material.

V. Observed Response in Periphery

A miscue was coded in this category whenever it was possible that the response word was in the peripheral visual field of the subject, i.e., it appeared in one or two lines above or below, or on the same line the subject was reading and the miscue could have been the result of "processing visual cues in the periphery, out of sequence." (Boodman, 1969).

As suggested by Goodman, for the purposes of this study the peripheral field was arbitrarily defined by two ovals around the miscue. The response could have been in the near field or in the extended field. The near field was defined as "the line in which the miscue occurs and one line above and below." The extended field was two lines above and below.

Table 25 shows the results obtained in this category.

For nine of the ten subjects, a percentage of their responses (ranging from 13.79 - 30.43%) was in their near peripheral field in December. For all these nine subjects,

TABLE 25

PERCENTAGE MISCUES IN PERIPHERY

	Near Field				Extended Field			
Subject	D	J	F	M	D	J	F	M
A	13.79	10.25	12.50	1.96	0	2.56	0	1.96
B	22.44	4.76	21.81	9.47	4.08	0	0	2.10
C	22.22	18.96	3.77	11.76	1.23	3.44	5.66	0
D	25.00	17.39	12.06	12.28	15.00	4.34	0	1.75
E	16.66	11.42	11.29	4.61	0	0	1.61	1.53
F	28.57	9.57	2.12	10.25	0	4.87	0	2.56
G	20.00	16.85	6.97	4.08	5.71	3.37	2.32	0
H	0	22.22	3.57	4.50	6.66	8.30	0	0
I	24.24	7.54	4.65	10.52	0	0	0	0
J	30.43	7.93	10.71	3.77	4.34	0	0	1.88

the miscues in which the stimuli were in the close peripheral field decreased as the study progressed from January to March, although the percentages fluctuated from month to month and not all the subjects had their lowest score in March.

In December, all the subjects except one (H) had more than 10 per cent of their miscues in this category (and the range of the percentages was from 13.70 per cent to 30.43 per cent).

In January, six of the subjects had more than 10

per cent of their miscues in this category;in February, five of the subjects had more than 10 per cent of their miscues in the close peripheral field and in March only four subjects had more than 10 per cent of their miscues in the close peripheral field--and the range of these percentages was much narrower than it had been in December (10.25 - 12.28). Subjects D, F, J had 25 per cent or more miscues in the close peripheral field in December. In March, their percentages had dropped but Subjects D and F still had 10 per cent or more miscues in the close peripheral field. Subject J's percentage of miscues, however, had dropped from 30.43 per cent in December to 3.77 per cent in March.

One subject, H, had no miscues in the close peripheral field in December. However, 22.22 per cent of the miscues he made in January were in the close peripheral field but the percentage dropped in February and by the end of the study, a small percentage (4.5) of his miscues were in his close peripheral field.

In all sessions and for all subjects a smaller percentage of miscues were in the extended field than in the near field. Only one subject in one month (Subject D) had more than 10 per cent of his miscues in the extended peripheral field--and this same subject had 25 per cent of his miscues in his close peripheral field in December. His reading seemed particularly affected by visual cues in the peripheral field. By the end of the study the percentage

of miscues that were in the extended peripheral field for all subjects was less than 3 per cent.

Summary: Percentage Miscues in Periphery

1. All subjects had a percentage of their miscues in which the stimuli were in their near peripheral field.

2. The percentage of miscues in which the stimuli were in their close peripheral field declined for the group as a whole as did the range of percentages. In December the percentages ranged from 16.66 per cent to 30.43 per cent. By March the range of percentages was from 1.96 per cent to 12.28 per cent.

3. Individual subjects varied from session to session in the percentage of miscues that were in the near peripheral field. For nine of the ten subjects, however, the percentage of miscues which were in the child's close peripheral vision was smaller in March than in December.

4. For all the subjects a smaller percentage of the miscues were stimuli in the extended field throughout the study. All showed a decrease in these percentages by March.

VI. Habitual Association

In this category of the taxonomy an analysis was made of the number of miscues that were habitual responses to the same stimulus. For the purposes of this study, a habitual response was defined as "two or more occurrences

of the same substitution for a printed stimulus."

No attempt was made to keep a record of the habitual, responses across stories for each subject.

Table 26 shows the percentage of miscues that were habitual associations as defined above.

TABLE 26

PERCENTAGE OF MISCUES THAT WERE HABITUAL ASSOCIATIONS

Subject	December	January	February	March
A	10.34	14.28	3.33	10.41
B	3.44	7.57	7.68	4.21
C	11.76	11.76	6.00	18.75
D	8.57	4.34	11.32	10.52
E	22.90	5.88	10.16	7.14
F	15.38	10.27	6.34	16.21
G	9.37	7.06	7.31	8.00
H	7.14	8.32	7.65	0
I	13.79	12.50	7.14	16.21
J	14.29	8.19	7.65	10.20

For all of the subjects, the percentage miscues that were habitual associations varied from month to month. Four of the subjects, however, had a smaller percentage of miscues that were habitual associations in March than in December (subjects J, H. G, E).

An examination was made of the types of miscues that became habitual associations for all months. It was found that 34.4 per cent of all miscues that were habitual associations were substitutions for proper names. This type of miscue was found in the reading of all subjects over the period of the study.

Thus, e.g., Subject F in January read the name "Rick" as "Rocket" every time it appeared in the story "A Baseball Game." He read the name of the dog "Pepper" as "Perry" every time it appeared in the same story. This same subject read the name of the swan "Hank" in the "Pink Swan" and "honk" each time it appeared in the story.

Subject G read the name of the town "Franklin" in "A Thinking Beggar" as"Frenchline" every time it appeared; Subject B read the name of the mule "Flop Ears" as "Flip Ears" and "Kate" as "Kit," "Jill" as Jim;" Subject C read "Nell" as "Nah," "Hal" as "Neil" and so on. Sometimes it seemed that a name was substituted that was more commonly associated with a particular animal; e.g., two subjects

substituted "Rex" for "Rags," the name of the dog in a story.

Three subjects (I, E, C) substituted "Rag" for "Rags" every time it appeared in the story. They seemed to process the "s" at the end of the name as a plural signal. When "Rags" was the subject of the sentence, of course, the verb was never plural and this seemed to confuse these subjects and led to the substitution of "Rag" for "Rags."

Generally, it seemed that with proper names the subjects had only graphic cues and past experience to help them identify the word correctly. If the name used for the character was an uncommon one, they had to rely entirely on graphic clues and then correspondence to phonemes to read the word. They could not rely on additional cues in the flow of the language to help them identify the word correctly--nor would they always be aware of the fact that they had made a miscue.

A few habitual associations seemed to be the result of reversals or transposals of letters in words, e.g., "left" was read for "felt," "Iln" for "Lin," "big" for "dig," "saw" for "was." This type of habitual association was a small percentage of the total.

Some habitual associations were between short words and the stimulus and the response had considerable graphic similarity.

E.g., "of" for "off"
"is" for "it"
"at" for "it"
"his" for "this"
"was" for "has"

Some of the habitual associations were acceptable responses in all the contexts in which they appeared.

E.g., a) two subjects reading the story "Frank and His Wagon" read "faster" in the sentence

"Faster and faster ran Frank"

as: "farther and farther ran Frank"

b) Subject C read the story "Hal" in January. Using picture clues and minimal graphic clues he read the word "fender" as "front" every time it appeared in the story. This miscue made little difference to the meaning of the story he was reading.

Occasionally, however, the habitual association was not acceptable. However, the subject had tried to correct the initial miscue several times, finally accepted it and was unable to obtain enough cues from the story as he read it to correct the miscue. Thus, e.g., Subject A read the story "Lin and Bill Get Lost." For the first sentence

"Lin and Bill plan a picnic"

he read:

"Lin and Bill plant a pinch"

He paused at "pinch," apparently aware of the fact that this was not acceptable, but made no attempt at correction. The next sentence was

"Lin will fill the picnic bags"

for which he read

"Lin will fill the pill . . . ; then

he regressed to correct "pill" to "pinch" and then regressed once more to correct "picnic" to "patch" and finished the sentence as "patch bag." From then on he read "picnic" as "patch" everytime it appeared and made no attempt to analyze or correct. From the beginning he had not obtained enough clues to enable him to correct that miscue. It must be pointed out here, that many of the stories provided minimal language clues to help the subject correct miscues, and this could account, partially, for the fact that all subjects, at all sessions, except one (H in March) had a percentage of miscues that were habitual associations.

Summary and Conclusions: "Habitual Associations"

1. In 97.5 per cent of the sessions the subjects had a percentage of miscues that were habitual associations.

2. The percentage of "habitual associations" varied for each subject from session to session, but four subjects had a smaller percentage of miscues that were habitual associations in March than in December.

3. About one-third of all the miscues that were habitual associations were substitutions for proper names.

4. A few habitual associations were the result of reversals or transposals of letters in words, but these

were a small percentage of the total.

5. Some of the "habitual association" miscues were acceptable in the contexts in which they appeared. Others were not and in these cases, there frequently were insufficient cues in the story to help subjects correct that particular miscue.

VII. Graphic Proximity of Stimulus and Response

In the taxonomy, a scale is used to measure the graphic similarity of the expected response and the observed response. The number 0 - 9 on the scale represent points of increasing graphic similarity. In creating a graphic representation of the observed response, the most likely spelling and the one closest to the expected response was chosen, if there were alternate possibilities. The following are explanations and examples representative of the points on the graphic proximity scale, as used to code the miscues in this category of the taxonomy.

0 - there was no similarity, graphically, between the stimulus and the response;

1 - the middle part of the words is the same, or the two words have one grapheme in common, although not in the same position in the words;

2 - the two words have the same endings, e.g., help<u>ed</u> - mov<u>ed</u>; ha<u>s</u> - i<u>s</u>;

3 - the two words have the same initial grapheme/s or the same initial syllable, e.g., perceive - perhaps;

4 - the stimulus and the response have key elements in common, e.g., went - wanted

5 - the stimulus and the response have initial and final graphemes in common, e.g., pets - puppies

6 - the stimulus and the response differ in one consonant grapheme. General configuration is the same, e.g., when - then

7 - the stimulus and the response have the same graphemes but the sequence of the letters in the response differs from the sequence of letters in the stimulus; or one or more letters in the response is a reversal of the letter in the stimulus, e.g., from - form; was - saw; felt - left; dug - bug

8 - the stimulus and the response differ in one vowel grapheme, e.g., batter - butter; ran - run

9 - the stimulus and the response are identical visually.

When more than one subcategory could be used for a miscue, the decision was made arbitrarily to code the miscue in the highest category.

Thus, e.g., the response "form" for "from" could have been coded

5 - initial and final graphemes are the same

and

7 - all the graphemes are the same, but the sequence of letters in the stimulus and response differs. On the above mentioned criterion, it was coded 7.

The graphic mean for each subject for each month was obtained by computing the average of the graphic proximity scores for all the miscues.

Table 27 shows the graphic means for each subject from December to March. Arbitrarily, a mean of 4.5 was taken as the dividing point on the scale. Those scores above that point are marked with an asterisk on the table to show the sessions for each child when more than half the miscues were closer to the stimulus graphically. For the purposes of discussion those means which were 4.5 or above were designated "high" graphic means. Those which were below 4.5 were designated "low" graphic means.

An examination of the table shows that four subjects obtained a "high" graphic mean in December and two others came close to scoring a "high" graphic mean (E, I). In January, none of the subjects obtained a "high" graphic mean, although two subjects, (F, H), both of whom had been high scorers in December, came close to scoring a "high" graphic mean. In the January session, too, the mean scores of seven of the subjects showed a drop from the December session and three showed slight increases in their means. In February, again, none of the subjects scored

above 4.5 but three subjects (A, C, I) came close to the mean of 4.5. For Subject A, this showed an increase from January to February, but his February score was still not as high as his December score. For Subject C, this was a continuation of the slight improvement seen from December to January. In March, only two subjects scored above 4.5--Subject A who had scored above the mean in December, and Subject E for whom this represented the first such score for all the sessions. However, three other subjects came close to scoring 4.5.

TABLE 27

GRAPHIC PROXIMITY OF STIMULUS AND RESPONSE (MEANS)

Subject	December	January	February	March
A	5.7878*	3.8688	4.1111	4.6458*
B	3.479	3.9649	3.8571	3.2530
C	3.7412	3.8383	4.0357	4.3939
D	3.0250	3.0833	3.5254	3.7735
E	4.266	3.5945	3.500	4.5238*
F	4.666 *	4.0652	3.6829	4.1351
G	3.4375	3.5494	3.9210	3.2168
H	5.1333*	4.368	3.3333	4.2750
I	4.1818	3.4042	4.2368	3.3589
J	5.1666*	3.9393	3.9285	3.3061
Range of Means:	3.0250-5.7878 2.7628	3.0833-4.3680 1.2847	3.3333-4.2368 .9035	3.2168-4.6428 1.4260

The range of the means for the whole group for each session is interesting and is shown on Table 27. The range of means was widest in December at the beginning of the study. It narrowed progressively in January and February, but then increased again in March. This perhaps reflects the method that was used to teach the group. The aim was to teach sound/symbol relationships in a structured sequence and at the beginning of the study all subjects in the group were taught the same relationships. It is possible that for some subjects in this group, this represented a review of material they already knew, while others were just beginning to establish those particular sound/symbol relationships. Of the four subjects who were "high scorers" in December only one was still a high scorer in March--and his mean showed a decrease from his mean in December.

However, the increase in the mean score in March is noteworthy. A little while before, the teacher of the group had decided that more differentiated teaching, to take account of individual differences in rates of learning the sound/symbol relationship, was necessary again. It is possible that the increase in the range of the means reflects this differentiated teaching and that this trend would have continued had the study been continued beyond March.

An analysis of the individual subcategories in this section of the taxonomy is more revealing of the way

in which these ten subjects used graphic clues over the months.

For every subject, in every session, more miscues were categorized in 1 - 9 than in 0. In other words, in the majority of instances miscues bore some resemblance graphically to the stimulus.

One subcategory (3) recorded those miscues in which the stimulus and response had the initial graphemes or syllables in common. Taking the group as a whole, more miscues were coded in this category than in any other single category 55 per cent of the time. Another subcategory (6) coded those miscues which differed from the stimulus by a single consonant grapheme. Taking the group as a whole more miscues were coded in this category than in any other single category 32.5 per cent of the time.

The subcategory (7) coded those instances in which the stimulus and response differed in the sequence of the letters. In no instance were more miscues coded in this category than in any other category.

The final subcategory looked at was 8--where miscues were coded if they differed from the stimulus by a single vowel grapheme. For the group as a whole more miscues were coded in this subcategory than in any other subcategory 7.5 per cent of the time.

For the group as a whole, therefore, miscues were coded most frequently in subcategories (3, 6, 7, 8) in 95 per cent of the sessions.

No particular pattern developed in the subcategories from December to March in the graphic relationship between the stimulus and response for the group as a whole or for individuals in the group.

Summary: Graphic Aspects of Miscues

1. The graphic means for each of the subjects in the study varied from month to month. Four of the subjects had "high" graphic means in December but only one of these four subjects had a "high" graphic mean.

2. Three of the subjects showed an improvement in their graphic means (from December to March), although in none of the three cases was the improvement very big (from .3 - 1.00). The other seven subjects showed a drop in their graphic means (from December to March) and these included the four subjects who had "high" graphic means in December.

3. In each month, a percentage of miscues made by each subject had no graphic similarity to the stimulus. The percentage varied from month to month, but was never a majority of the miscues (i.e., most miscues bore some graphic relationship to the stimulus).

4. In 95 per cent of the sessions the majority of miscues were coded in the subcategories 3, 6, and 8 together. Of those three subcategories, more miscues were coded more frequently in (3) than in any other single subcategory (i.e., more miscues were similar in initial graphemes than

in any other respect).

5. For the group as a whole, subcategory (6) was the second in the order of frequency with which more miscues were coded than in any other subcategory.

6. Therefore, despite a reading program which emphasized the establishment of sound/symbol relationships these ten subjects were still using initial graphic clues most frequently in reading. The results obtained in this category may have been partly due to the fact that the order of presentation of phoneme/grapheme correspondence in their reading program differed from the order of their presentation in the series of readers used in the study.

VIII. Phonemic Aspects of Miscues

A similar scale is used in the taxonomy to represent the phonemic similarity between the expected response and the miscue (or observed response). In this case, it was necessary to assume an oral equivalent for the expected response. The following examples are representative of the points on the phonemic similarity scale as used in this study:

0 - there is no similarity, phonemically, between the stimulus and the response;

1 - the stimulus and the response have one similar phoneme in common, e.g., saw - was; has - is; thi<u>ck</u> - tu<u>ck</u>

2 - the initial phoneme of the stimulus and the

response is similar, e.g., cap - kite; tugged - took

3 - the initial and final phonemes of the expected response and the observed response are similar, e.g., pets - puppies; cart - cat

4 - the initial and final syllables of the expected response and the observed response are similar, e.g., quietly - quickly

5 - the base form of the expected response and the observed response is the same, e.g., unusual - usually

6 - the expected response and the observed response differ in one consonant phoneme, e.g., how - now; beat - bead; tramped - trapped; under - unter

7 - the expected response and the observed response differ in one vowel phoneme, e.g., grow - grew; far - for; run - ran

8 - the expected response and the observed response differ very slightly (schwa sound), e.g., want - wint

9 - the expected response and the observed response are homophones.

Once again, if a miscue could be coded in two categories, the decision was made to code it in the highest ranking category.

The phonemic mean for each subject in each month

was obtained by computing the average of the phonemic proximity scores for all miscues.

Table 28 shows the phonemic means for each subject from December to March. Here again, a mean of 4.5 was taken as the dividing point on the scale and means at and above 4.5 were designated "high" phonemic means, i.e., more of the observed responses and the expected responses had a close phonemic proximity. Those below 4.5 were designated low phonemic means, i.e., more of the observed responses and the expected responses did not have a close phonemic proximity.

The "high" phonemic proximity scores are marked in Table 28 with an asterisk.

The table shows that in only one session, for one student, was a "high" phonemic proximity score obtained. On only one occasion was a subject close to obtaining a "high" phonemic proximity score (Subject J) in December.

Three subjects (A, C, D) showed an improvement in their phonemic proximity scores from January to March as follows:

	Improvement
Subject A	.2916
Subject C	.7099
Subject D	1.2186

Subject D, therefore, showed the most improvement. It is interesting to note that he had the lowest phonemic proximity score in December.

TABLE 28

PHONEMIC PROXIMITY OF MISCUES (MEANS)

Subject	December	January	February	March
A	3.1764	1.7234	2.5862	3.4680
B	2.6666	3.3448	3.2558	2.4750
C	3.0476	2.6833	3.2456	3.7575
D	1.9512	2.6400	2.4067	3.1698
E	4.6428*	2.3055	2.9859	3.6562
F	3.6666	3.1111	2.2857	3.1621
G	2.4062	2.4065	3.1578	2.2000
H	3.8888	3.8648	3.1111	3.3250
I	3.3125	2.7209	2.3750	2.2682
J	4.1052	2.5454	3.4285	2.6041
Range of Means:	1.95 - 4.64	1.72 - 3.86	2.37 - 3.42	2.2 - 3.75
Difference:	2.69	2.14	1.05	1.55

Five of the subjects (E, F, H, I, J) showed a decrease in their phonemic scores, although as in the case of the three who showed improvements, the difference between their scores in December and March was not large:

	Decrease
Subject E	.0866
Subject F	.5045
Subject H	.5638
Subject I	1.044
Subject J	1.5012

Two of the subjects (B, G) showed an erratic pattern from month to month. However, neither subject attained a "high" mean at any session.

The range of phonemic means for the group as a whole for each month is shown in Table 28.

As in the case of graphic proximity means:-

a) the range in the phonemic means for the group as a whole narrowed from December to March;

b) the narrowest range is found in February and the largest range is found in December;

c) there seems to be a slight upward trend in March, although the level reached in December was not reached again during the duration of the study.

An analysis of the individual subcategories in this section of the taxonomy is more revealing of the way in which these ten subjects used phonemic clues over the ten months.

For every subject, for every month, more miscues were categorized in the subcategories 1 - 9 combined than in the subcategories, i.e., the majority of miscues bore some phonemic resemblance to the stimulus.

Those miscues which bore no phonemic resemblance to the expected response were coded in the 0 subcategory. For the group as a whole miscues were coded most frequently in this category, i.e., in 37.5 per cent of the sessions, more miscues were coded in this subcategory (because

they bore no phonemic resemblance to the expected response) than in any other single subcategory. This is a marked contrast to the frequency with which this occurred in the graphemic proximity section of the taxonomy (2.5 per cent of the time). (Those miscues which had the initial phoneme in common with the stimulus were coded in subcategory 2.)

For the group as a whole miscues were coded most frequently in this subcategory 32.5 per cent of the time, i.e., for 32.5 per cent of the sessions more miscues were coded in this subcategory than in any other single subcategory. It seemed that for the whole group the grapheme-phoneme correspondence was most effectively used with initial phonemes.

Those miscues which differed from the expected response in one consonant phoneme only were coded in subjcategory 6. For 17.5 per cent of the sessions more miscues could be categorized here than in any other single subcategory; and for 12.5 per cent of the sessions more miscues could be categorized in subcategory 5 (the base from of the expected response and the observed response is the same).

No particular pattern (e.g., showing a marked increase in one type of phonemic miscue over another) developed over the months. Some individual subjects, however, showed a characteristic pattern over the months,

e.g., Subject G consistently had more miscues that bore no phonemic resemblance to the stimulus than miscues that could be coded in any other subcategory. In December, Subject A had more miscues that resembled each other in initial and final phonemes than in any other way, but this did not seem to be his characteristic behaviour. Subject C had more miscues that differed only in one consonant phoneme (subcategory 6) than miscues that differed in any other way. This pattern was the same in December, January and in February. In March, however, two subcategories had the highest number of miscues--and the number was higher than that coded in any other category (7 and 0).

Summary: Phonemic Aspects of Miscues

1. The phonemic means for five subjects showed a decrease from December to March; for three of the subjects the mean showed an increase from December to March. However, the change was not very great for any of the subjects. Two of the subjects showed an erratic pattern from month to month, but the difference in the mean was not very great.

2. The range of phonemic means for the whole group for each month narrowed from December to February. The greatest range was found in December, the lowest in February. There was a slight increase in the range in

March.

3. In 37.5 per cent of the sessions more miscues were coded in subcategory 0 (i.e., they bore no phonemic resemblance to the stimulus) than in any other single subcategory.

4. In 32.5 per cent of the sessions more miscues were coded in subcategory 2 (stimulus and response resemble each other in initial phonemes) than in any other single subcategory.

IX. Grammatical Function of Stimulus and Response

In this category of the taxonomy, both the miscue and the response which it apparently replaced were coded according to their grammatical function. Six subcategories were used: noun, verb, adjective, adverb, function word and indeterminate. Following Goodman (1969), non-words were categorized according to inflectional ending and intonation as well as syntactic pattern, if possible. The category into which the miscue was coded was chosen on the basis of actual function in the context.

Tables 29 - 38 show the relationship between the grammatical function of stimuli and the miscued responses for the whole study. They show that in the majority of instances, the subjects' miscues had the same grammatical function as the stimuli. In the tables, the circled

TABLE 29

GRAMMATICAL FUNCTION OF STIMULUS AND RESPONSE

Grammatical Function of Stimulus

SUBJECT A	Grammatical Function of Response					
	N	V	Adj.	Adv.	FW	I
Noun	80.70	3.50	3.50	3.50	8.77	0
Verb	5.00	92.5	0	0	2.5	0
Adjective	27.27	0	45.45	9.09	0	18.81
Adverb	0	0	0	28.57	71.42	0
Function Word	7.69	7.69	3.84	0	80.76	0
Indeterminate	0	0	0	0	0	0

TABLE 30

Grammatical Function of Stimulus

SUBJECT B	Grammatical Function of Response					
	N	V	Adj.	Adv.	FW	I
Noun	73.76	12.50	0	4.16	9.72	0
Verb	7.14	87.14	0	1.42	2.85	1.42
Adjective	22.22	11.11	22.22	22.22	0	22.22
Adverb	20.00	0	20.00	40.00	0	0
Function Word	9.58	9.58	1.36	1.36	75.34	2.73
Indeterminate	0	0	0	0	0	0

TABLE 31

GRAMMATICAL FUNCTION OF STIMULUS AND RESPONSE

Grammatical Function of Stimulus — SUBJECT C	Grammatical Function of Response					
	N	V	Adj.	Adv.	FW	I
Noun	86.27	5.88	0	1.96	5.88	0
Verb	12.69	69.84	9.52	0	6.34	1.58
Adjective	41.17	23.52	35.29	0	0	0
Adverb	0	0	0	33.33	66.66	0
Function Word	0	0	0	0	100.00	0
Indeterminate	0	0	0	0	0	0

TABLE 32

Grammatical Function of Stimulus — SUBJECT D	Grammatical Function of Response					
	N	V	Adj.	Adv.	FW	I
Noun	69.64	17.85	5.35	1.78	10.71	0
Verb	3.70	83.33	0	0	7.40	1.85
Adjective	40.00	0	60.00	0	0	0
Adverb	28.57	0	14.28	0	57.14	0
Function Word	11.11	11.11	0	0	77.77	0
Indeterminate	0	0	0	0	0	0

TABLE 33

GRAMMATICAL FUNCTION OF STIMULUS AND RESPONSE

Grammatical Function of Stimulus — SUBJECT E	Grammatical Function of Response					
	N	V	Adj.	Adv.	FW	I
Noun	76.66	11.66	1.66	0	10.00	0
Verb	2.22	95.55	2.22	0	0	0
Adjective	15.38	15.38	38.46	15.38	15.38	0
Adverb	0	0	0		40	60
Function Word	14	4	4	2	72	0
Indeterminate	0	0	0	0	0	0

TABLE 34

Grammatical Function of Stimulus — SUBJECT F	Grammatical Function of Response					
	N	V	Adj.	Adv.	FW	I
Noun	79.16	8.33	4.16	4.16	6.25	0
Verb	0	94.44	2.77	0	2.77	0
Adjective	33.33	0	66.66	0	0	0
Adverb	25.00	12.5	0	37.5	25.0	0
Function Word	9.09	6.06	0	15.15	66.3	0
Indeterminate	0	0	0	0	0	0

TABLE 35

GRAMMATICAL FUNCTION OF STIMULUS AND RESPONSE

Grammatical Function of Stimulus — SUBJECT G	Grammatical Function of Response					
	N	V	Adj.	Adv.	FW	I
Noun	84.21	9.21	2.63	0	2.63	1.31
Verb	2.38	83.33	2.38	2.38	9.52	
Adjective	66.66	0	22.22	11.11	0	0
Adverb	100.00	0	0	0	0	0
Function Word	2.89	10.14	0	0	86.95	1.44
Indeterminate	0	0	0	0	0	0

TABLE 36

Grammatical Function of Stimulus — SUBJECT H	Grammatical Function of Response					
	N	V	Adj.	Adv.	FW	I
Noun	92.00	2.00	0	0	6.00	0
Verb	21.73	78.26	0	0	0	0
Adjective	14.28	0	71.42	0	14.28	0
Adverb	0	0	0	16.66	50.00	33.33
Function Word	18.51	3.70	3.70	3.70	70.37	0
Indeterminate	0	0	0	0	0	0

TABLE 37

GRAMMATICAL FUNCTION OF STIMULUS AND RESPONSE

Grammatical Function of Stimulus — SUBJECT I	Grammatical Function of Response					
	N	V	Adj.	Adv.	FW	I
Noun	83.67	6.12	4.08	4.08	2.04	0
Verb	8.16	89.79	0	0	0	2.04
Adjective	20.00	0	80.00	0	0	0
Adverb	100.00	0	0	0	0	0
Function Word	10.34	0	0	0	89.65	0
Indeterminate	0	0	0	0	0	0

TABLE 38

Grammatical Function of Stimulus — SUBJECT J	Grammatical Function of Response					
	N	V	Adj.	Adv.	FW	I
Noun	85.71	8.16	0	0	6.12	0
Verb	6.38	93.61	0	0	0	0
Adjective	0	12.50	37.50	25.00	25.00	0
Adverb	27.27	18.18	0	27.27	27.27	0
Function Word	8.82	14.70	2.94	0	73.52	0
Indeterminate	0	0	0	0	0	0

figures show the percentage relationship when the grammatical function of the stimuli and the miscues were the same. The other percentages show the relationships when the grammatical functions and the stimuli were not the same.

A number of stories were sampled from each reader used to determine the percentage of nouns, verbs, function words, adjectives and adverbs used.

In most of the stories sampled, nouns or function words had the highest percentage and verbs the third highest. Together these three classes constituted a major percentage of all the words used in the stories. A much smaller percentage were adjectives and adverbs.

The miscues made by the subjects in this study followed this pattern, i.e., when miscues were examined to determine their grammatical function, it was found that the majority of miscues fell into these classes. The percentage of miscues made by each subject in each category did not necessarily follow the percentage distribution of each category found in the stories sampled, for example, Subject C made a higher percentage of miscues with stimuli that fell into the verb category than any other category. This despite the fact the percentage distribution of words in the categories noun, verb, function word in the stories he read was the same as that described above. An examination of his verb miscues shows

that in December and January his miscues in this category consisted mainly of the substitution of one tense for another. The early stories he read were mainly in the present tense and for the present tense verbs he substituded past past tense verbs. This seemed a more natural language pattern for him. In February and March he was substituting a verb of the same tense as that of the story--or correcting himself if he had not done so. This same subject, however, had the lowest overall percentage of agreement between the stimulus and the response in the verb category of all the subjects. He had the highest percentage of agreement between stimulus and response in the verb category in December (80 per cent) and this percentage remained fairly constant through January and February. He had the lowest percentage of agreement in March (58.3 per cent). In the March session, he read a story "Flat Sam" which gave him particular trouble. Every time the verb "dig" appeared in the text, he read it as "big." Occasionally, there were enough cues in the sentence pattern to enable him to correct his miscue. E.g., he starte to read the sentence:

> "Clams can dig in the sand"

as

> "Clams and big . . .

then he paused, regressed and corrected his miscue. The next time the stimulus "dig" appeared in the story was in

the sentence

"Dig, clams, dig!"

He read it as "Big clams, big!" He regressed, presumably because he was aware that this was not acceptable in the total context, but was unable to correct the miscue. Similarly, he read the sentence

"Dig far into the sand!:

as "The big fur . . . ."

then he regressed, and reread the phrase in the same way. It seemed that in this particular sentence pattern he was unable to get enough clues to enable him to substitute a verb for the verb in the text. A sentence pattern that began with a verb seemed to confuse him. Perseveration could have been a factor here too, making it difficult for him to switch to a pattern different from the one he had started.

Four of the subjects (B, E, G, H) had a pattern of distribution of miscues in the grammatical categories in the stories they read, i.e., nouns or function words were the largest percentage and verbs ranked third. The other five subjects (A, D, F, I, J) showed a different pattern. For them, nouns were the largest category, followed by verbs and then by function words. An examination of their miscues from month to month did not reveal any reason for this. There was considerable overlap in story material read by this group of subjects and the first group studied.

All the subjects showed fluctuating percentages of miscues within each category from session to session.

The percentage of similarity of grammatical categories of the stimulus and the response was examined for each category:

1. Noun Category

For the group as a whole the percentage of similarity for the noun category ranged from 50 to 100 per cent. From session to session, the subjects' performance in each category varied. Table 39 shows the fluctuation and the range in percentage of similarity for each subject over the four sessions, in the noun category.

TABLE 39

NOUN CATEGORY

PERCENTAGE OF SIMILARITY FOR THE NOUN CATEGORY

Subject	December	January	February	March
A	100	84.1	69.23	61.4
B	69.2	86.3	66.66	68.1
C	71.4	91.66	68.75	100
D	62.5	50.00	75	71.4
E	80.0	77.77	80.00	68.75
F	85.7	85.7	63.63	86.66
G	60.0	96.4	90.0	87.5
H	100	83.33	75	100
I	90.0	78.78	83.33	82.3
J	100.0	86.6	87.5	86.66

2. Verb Category

For the group as a whole (for all sessions) the percentage of similarity for the verb category ranged from 50 per cent to 95.55 per cent. It seemed to be a very strong category for most subjects; this despite the fact that for five subjects the percentage of total miscues that were responses to verb stimuli was higher than expected. The percentage of verb responses to verb stimuli generally never fell below 60 per cent for the group as a whole. On the three occasions when the percentage was lower seemed isolated instance for each subject. The other percentages obtained by the same subjects were widely discrepant.

Table 40 shows the fluctuation and the range in percentage of similarity for each subject over the four sessions, in the verb category.

3. Function Words

Again, agreement between response and stimulus function words are generally high, and stayed above 60 per cent (Subject H) except for Subject J in December, Subject B in February and Subject F in March.

Table 41 shows the fluctuation and the range in percentage of similarity for each subject over the four sessions in the function words category.

TABLE 40

PERCENTAGE OF SIMILARITY FOR THE VERB CATEGORY

Subject	December	January	February	March
A	100	100	73.66	92.4
B	82.3	86.3	90.4	90.0
C	80	73.9	72.72	58.33
D	90	50	90	88.88
E	100	87.5	100	94.12
F	100	100	89.00	100.00
G	66	92.6	87.5	83.1
H	100	42	71.5	100
I	100	80.96	100	88.88
J	75	88.3	100	100.00

TABLE 41

PERCENTAGE OF SIMILARITY FOR THE FUNCTION WORD CATEGORY

Subject	December	January	February	March
A	80	100	100	60
B	90.9	66.6	46.66	87.5
C	100	100	75	100
D	72.72	88.88	63.66	83.33
E	100	78.5	81.2	66.66
F	100	100	63.63	53.8
G	90.9	87.5	88.88	79.25
H	50	75	83.33	63.63
I	100	75	100	100
J	20	86.6	100	64.2

4. Adjective and Adverb Categories

There were very few words in the categories in the stories sampled for categories of words used, e.g., many of the stories read in December had no adjectives. In those stories in which adjectives did appear the agreement was not as high as for other categories and ranged from 20 percent to 100 per cent. Most frequently, nouns were substituted for the adjectives.

The adverb category was particularly weak and generally the subjects in this study were unable to substitute an adverb for an adverb response. The percentage of agreement for the adverb category ranged from 0 to 100 per cent from session to session. All categories of words were substituted for adverbs that were miscued--with function words being substituted most frequently.

Summary and Conclusions: Grammatical Function of Stimulus and Responses

1. Generally, the miscues of these ten subjects tended to be in the same grammatical category as the stimuli which they replaced.

2. The ability to substitute words in the same grammatical category as the stimuli was pronounced at the beginning of the study and remained so during the period of the study. The strongest categories were nouns, function words and verbs. There were very few adjectives in the stories read in this study and the percentage of agree-

ment was not as high as for the other categories. Agreement was lowest for the adverb category for all subjects and words belonging to all categories were substituted for the adverbs in the story.

3. The percentage of miscues for each category was not always the same as the distribution of those categories in the stories read. Five of the subjects showed a higher percentage of verb miscues than could be expected from their distribution in the stories. Some of the reasons for this could be

a) the position of the verb in the sentence. When it appeared at the beginning of the sentence, this seemed an unnatural sentence pattern for the subjects, and one they could not manipulate.

b) the tense of the verbs--stories written in the present tense seemed to present difficulty and subjects substituted past tense verbs for present tense verbs.

X. Levels of Language

In this category, miscues were analyzed on five levels of language. Each miscue was considered in terms of every one of the five levels and it was possible for one miscue to be categorized in two or more of the subcategories, although this did not always happen. A miscue that was an omission on one level could be a substitution on another level. For example, the substitution of "went"

for "wet" results in a submorphemic insertion, but a substitution, at the word level, of one word for another. No choice was made, when two or more levels were appropriate, as to which level best fitted a particular miscue. Instead a miscue was coded at each level which applied to it. Within each level, a miscue was classified in terms of its type, for example, as a substitution, inseration, omission or reversal. The levels, with an example of each of the types are given below and follow Y. Goodman (1967) and K. Goodman (1969).

1. Submorphemic level: (miscue involving a shift within a morpheme)

Substitution:	bit/bat
Insertion:	tanks/tranks
Omission:	tracks/tacks
Reversal:	saw/was

2. Bound morpheme level: All miscues involving inflectional, derivational and combined form morphemes.

Substitution:	televised/television
Insertion:	usual/unusual
Omission:	predetermined/determined
Reversal:	small worker/smaller work

3. Word Level:

Substitution:	the train was/the toy was
Insertion:	the baby cried/the little baby cried
Omission:	that the fish/the fish
Reversal:	the crying child/the child crying

4. <u>Phrase Level</u>: This was marked whenever a miscue caused a syntactic change at the phrase level.

   Substitution: the yellow dog/the dog started toward the rimrock/started to work the rimrock

   Omission: plants that grew under water, snails and . . ./plants that grew underwater snails and . . .

   Reversal: pick the sticks up/ pick up the sticks

5. <u>Sentence Level</u>: A graphically defined unit.

   Substitution: Now Skippy was gone/Now Skippy was gone?

Reading through terminal punctuation is coded as substitution of one sentence for two.

   Omission: of a sentence

   Reversal: Tom helped father. Then he helped mother./Tom helped mother. Then he helped father.

For each subject in each session the totals for each level of language were obtained and their percentage of the total number of miscues made by the subject was computed. Within each level, the percentage of miscues that were substitutions, insertions, omissions or reversals, was computed.

Table 42 gives the total percentage of miscues at each level for each subject for all sessions from December to March.

For all subjects, in each session, the vast majority of miscues were at the word level. This is to be expected since written English is word bound. Of this mis-

TABLE 42

PERCENTAGE OF MISCUES ACCORDING TO MISCUE YSTEMS (for all months December-March)

Subject	Submorphemic	Bound Morpheme	Word	Phrase	Sentence
A	30	6.87	98.75	-	3.75
B	24.35	66.42	99.26	5.16	1.47
C	32.96	13.4	99.8	2.79	5.58
D	25.41	11.6	98.9	3.5	5.6
E	33.16	7.77	89.11	2.59	1.03
F	26.58	12.02	98.73	3.16	3.16
G	25.64	10.98	100	5.86	2.93
H	25.36	13.76	81.15	5.79	2.89
I	17.98	11.11	95.23	2.11	1.05
J	24.29	9.60	98.30	2.82	2.82

cues, the highest percentage were substitutions for all subjects for all sessions. The next most common types of miscues at the word level were omissions and insertions--each was the next most common type of miscue at the word level 42.5 per cent of the time.

For all subjects, for most sessions, the next highest percentage of miscue after the word level, was on the submorphemic level. The two exceptions to this were Subjects F in January and H in December when their next highest level of miscues were at the bound morpheme level. Again this result is not surprising. It is often remarked that a major difficulty that dyslexic children experience in reading is with the sound/symbol relationship, and with noting accurately details in words.

Six subjects showed a lower percentage of miscues at this level in March than in December; three showed a higher percentage of miscues at this level in March than in December and one had the same percentage in those two months. However, no pattern emerged for the group as a whole from month to month except a fluctuating one. From month to month, the percentage of miscues at this level rose or dropped and no trend could be discerned.

The next highest level of miscues, for all subjects, after the submorphemic level was the bound morpheme level. The percentage of miscues shown at this level varied from subject to subject and within a subject from session to session. The highest percentage miscues at this level re-

corded was 33.3 per cent. At two sessions only no miscues were made at this level. Most miscues at this level involved inflectional suffixes.

For eight of the subjects, however, the percentage of miscues on this level declined from December to March; for two (G and I) the percentage showed an increase and the percentages were quite random from month to month.

From December to March the subjects were given more difficult stories. As these stories became more difficult, they contained more bound morphemes, particularly inflectional suffixes. The fact that miscues on this level decreased as the study progressed, while the number and type of inflectional suffixes increased in the story material, would seem to indicate an increased awareness of, and ability to handle, these suffixes in reading as the study progressed. Furthermore, since these subjects were particularly strong in processing syntactic information, it could be that inflectional suffixes gave them additional cues of the kind they were best able to use.

Phrase and sentence level miscues were a small percentage of the total number of miscues for each subject during the period of the study. In December four of the subjects showed no miscues at the phrase level, seven showed no miscues at the sentence level. In January, two showed no miscues at the phrase level, and four showed none at the sentence level. In February two subjects showed no miscues at the phrase level and one at the sen-

tence level. By March, only one subject made no miscues at the phrase level and all subjects were making miscues at the sentence level. It could be that these subjects were beginning to process information over larger units of language. However, the percentage of miscues over larger units was always very small and it seems that generally, these subjects were not able to process information over larger units of language.

At each level of language the highest percentage of types of miscues were substitutions. Table 43 shows the figures relating to the types of miscues computed for the group as a whole. Insertions accounted for the next highest percentage of miscues at the submorphemic and bound morpheme levels, but omissions accounted for the next highest percentage of miscues at the word and sentence levels. Reversals were the second highest percentage of miscues at the phrase level.

TABLE 43

PER CENT OF TYPES OF MISCUES (WHOLE GROUP)

	Submorpheme Level	Bound Morpheme	Word Level	Phrase Level	Sentence Level
Substitution	60.02	57.48	90.67	69.80	63.33
Insertion	16.98	27.49	3.90	2.71	16.66
Omission	12.31	11.88	4.94	7.08	21.00
Reversal	6.46	0	.77	10.39	-

Most reversals were accounted for at the phrase level and at the submorphemic level and the highest percentage of reversal miscues were found at the phrase level. All subjects except two showed this type of miscue at one or more sessions during the study.

TABLE 44

PER CENT OF MISCUES AT EACH LEVEL
(for the whole group) for all Sessions

Submorpheme:	25.71
Bound Morpheme:	16.00
Word Level:	95.82
Phrase Level:	3.43
Sentence:	2.72

Table 44 shows the percentage of errors at each level of language for the whole group for all sessions.

Summary and Conclusions: Levels of Language

1. The highest percentage of miscues for all the subjects in this study was at the word level. This remained the case through the duration of the study.

2. In the vast majority of instances, for all subjects, miscues at the submorphemic level were the next highest percentage of miscues. This remained the case throughout the period of this study.

3. As the study progressed, more subjects showed a percentage of miscues at the phrase and sentence levels. How-

ever, the percentage of miscues at these levels were always small and seemed to indicate difficulty in integrating information from larger units of language.

4. All subjects had a percentage of miscues at the bound morpheme level. The majority of subjects showed a decline, over the period of study, in the percentage of miscues at this level. This could have been due to an increasing awareness and ability to handle bound morphemes such as inflectional suffixes or to an increased opportunity presented in the material read, to process syntactic information, at which these boys were particularly strong.

5. At all levels of language substitution miscues accounted for a large percentage of all miscues. Insertions accounted for the next highest percentage of miscues at the submorphemic and bound morpheme levels, but omissions accounted for the next highest at the phrase and sentence levels.

6. The percentage of reversal miscues was highest at the phrase level (10.39 per cent); they accounted for 6.46 per cent of miscues at the submorphemic level and .77 per cent at the word level. Eight subjects showed this type of miscue at one or more sessions during the period of the study.

XI. Syntactic Proximity

In this category the miscues were examined to determine to what extent the syntax of the miscue differed

from that of the expected response. The scale suggested by Goodman for this category ranges from 0 - 8, each point on the scale representing a point of increasing similarity. The average score for all miscues for each subject in each session was calculated and termed the syntactic mean.

The basic definitions of the points on the syntactic scale follow with examples. They are taken from K. Goodman (1969):

0 - The syntax of the stimulus and the response are unrelated.

Stimulus: Oh, good . . .

Response: Who . . .

1 - The syntax of the stimulus and the response has little in common.

Stimulus: A policeman stared at them.

Response: I . . .

2 - The syntax of the response and the stimulus has a key element which retains the syntactic function of the stimulus.

Response: . . . had flown over Joel's father.

Stimulus: . . . had flown over Joel's father.

3 - There is a major change in the syntax of the response.

Stimulus: Inside there was usually

Response: Inside there were unusual

4 - There is a change in phrase structure of the re- response which is accompanied by an intonation

change.

Stimulus: . . . that grew under water, snails, and

Response: . . . that grew underwater snails, and

5 - There is a syntactic change ocurring within the phrase structure of the response.

Stimulus: . . . most of them came from jungle rivers where . . .

Response: . . . most of them came from Jungle River where . . .

6 - There is a change in person, tense or number of response.

Stimulus: How he wanted to go back.

Response: How he wants to go back.

7 - There is a change in the choice of function word or another minor shift in the response.

Stimulus: There was a dinosaur.

Response: There was one dinosaur.

8 - The syntax of the response is unchanged from the syntax of the stimulus.

Stimulus: The windows were full of puppies and kittens.

Response: The windows were full of pets and kittens.

Table 45 shows the syntactic proximity means for each subject for each month December to March. A mean score of 4.0 (being the mid point on the scale) was arbitrarily taken as the dividing point and all syntactic

proximity scores above that were considered "high" scores and those below that were considered "low" scores. It will be seen that no subject scored below 4.00 at any session.

TABLE 45

SYNTACTIC PROXIMITY (MEANS)

Subject	December	January	February	March
A	6.36	6.91	4.75	5.58
B	5.60	5.75	5.59	4.76
C	6.14	6.31	6.03	5.36
D	5.11	5.28	4.95	5.22
E	6.73	5.81	6.26	5.66
F	6.56	7.04	5.33	5.55
G	4.32	6.59	4.80	5.65
H	6.53	6.17	5.16	6.14
I	6.25	4.00	5.28	6.20
J	6.84	5.60	7.32	5.22
Range:	4.32 - 6.84	4.00 - 7.04	4.75 - 7.32	4.76-6.20
	2.51	3.04	2.57	1.44

The range of syntactic means for the group as a whole was largest in January and smallest in March. The mean scores fluctuated from month to month for each subject but the fluctuation was usually not very great. Those means which changed by 1.0 or more were examined to deter-

mine what factors could have influenced the change in the syntactic mean.

Subject B had a drop of 2.16 between January and February in his mean syntactic score. In February, Book C of the Lippincott series was introduced to the subject and he was asked to read stories from this book. Book C in this series has longer stories which contain longer and more complex sentences than any of the prior books in the series.

Subject F showed a drop of 1.71 in his syntactic mean from January to February. He was introduced to the stories in Book C in February. In December and January he had read stories from earlier books in the series.

Subject G showed a drop of 1.79 from January to February and he, too, was introduced to the stories in Book C in February. Subject H showed a drop in mean score of 1.00 from January to February, when he was introduced to the stories in Book C. Subject J showed a contrary pattern to that shown by the last five subjects discussed. He showed the most fluctuation of all the subjects from month to month. He showed a drop of 1.23 from December to January when he read stories from the "Blue Book" and Book B of the Lippincott series. In December he had read stories from Books A and B. In February he read one story from Book B and one story from Book C and his mean score rose by 1.71. In March he read all his stories from Book C of the Lippincott series and his mean dropped by 2.09--

the largest change he showed during the period of the study.

Subject I showed a drop of 2.25 from December to January. In January he read the stories "Little Elephant" and "Who said Hello" from the"Ginn 360" series. His mean rose again in February (by 1.28) when he read from the Lippincott series and again by 1.0 in March when he read from a parallel reader.

It seemed, therefore, that generally these subjects were well able to process syntactic information from the beginning of the study. Generally, they were able to do so more successfully when reading the shorter stories which contained shorter sentences. It must be pointed out that this study stopped at the point of change for the subjects discussed, i.e., at the point when they were introduced to longer stories. If the study had been continued for a longer period of time, perhaps a rise in their syntactic means would have been seen, as they continued to read longer stories.

The percentage miscues which was coded in each subcategory was examined for each subject. It was found that for each subject at each session, the majority miscues had some degree of syntactic proximity rather than no syntactic proximity to the stimulus. For the group as a whole in 87.5 per cent of the sessions more miscues were coded in subcategory 8 (there is no change in syntax between the stimulus and the response) than in any other single subcategory.

For the group as a whole, in 7.5 per cent of the sessions more miscues were coded in subcategory 0 (there is no similarity between the stimulus and the response) and in 5 per cent of the sessions more miscues were coded in subcategory 7 (there is a change in the choice of function word or another minor shift in the response) than in another subcategory.

For the group as a whole the second highest percentage of miscues were coded in subcategory 7(there is a change in the choice of function word or another shift in the response) 36.3 per cent of the time and in subcategory 6 (there is a change in person, tense or number of the response) 40.0 per cent of the time. Subcategory 8 accounted for the second highest percentage of miscues (as opposed to other individual subcategories) 10 per cent of the time and subcategory 3 accounted for them the remainder of the time.

Summary and Conclusions: Syntactic Proximity

1. All the subjects had a large majority of miscues which had some syntactic proximity to the stimulus as opposed to no syntactic proximity. This was true for the entire period of the study.

2. Subjects introduced to stories that were longer and that contained longer sentences than those they had read previously, showed a drop in syntactic mean during the session when they were first introduced to these

stories.

3. For all the subjects, for all the sessions more miscues were coded in subcategory 8--indicating that the syntax of the stimulus and the response remained the same--than in any other single subcategory.

4. Subcategories 7 and 6 (change in choice of function word; change in person, tense or number of the response) accounted for the second highest percentage of miscues (as opposed to other individual subcategories) in 76.6 per cent of the sessions.

XII. Semantic Proximity

In this category of the taxonomy the similarity in the meaning of the stimulus and the response was measured on a scale with points from 0 - 9, each point representing increasing semantic similarity between the stimulus and the response. The semantic average was computed for each subject in each month of the study.

The basic definitions of the points on the semantic scale follow with examples, and are taken from K. Goodman (1969).

0 - The meaning of the response and the stimulus are unrelated.

Stimulus: One side of the store was covered with rows of smaller tanks.

Response: One side of the store was covered with rows of smaller tranks.

1 - The meaning of the response is vaguely related to context.

Stimulus: "Let's go!" said Danny. "A policemen . . .

Response: "Let's go!" said Danny. "I . . .

2 - The meaning of the response is appropriate, but unrelated to the stimulus.

Stimulus: Lan Ying stared across the river.

Response: Lan Ying started across the river.

3 - The meaning of the response is semantically associated with either prior or subsequent portions of the text.

Stimulus: . . . and yet he, too.

Response: . . . and yet he knew.

4 - There is some association between the meaning of the response and the expected response (stimulus).

Stimulus: Her sense of routine told her.

Response: Her sense routine told her.

Or, there has been a meaning change resulting from a shift in intonation.

Stimulus: . . . under water, snails . . .

Response: . . . underwater snails

5 - The stimulus and the response are antonyms.

Stimulus: Inside there was usually

Response: Inside there was unusual

6 - The response has an associated meaning with the stimulus.

Stimulus: Danny had to hold up the wires for him.

Response: Danny had to hold up the telephone.

7 - The response involves a slight change in connotation or a similar name substitution.

Stimulus: Mr. Barnaby was

Response: Mr. Barnberry was

8 - The stimulus and the response are synonyms.

Stimulus: The lady's wig was

Response: The lady's fake hair was

9 - There is no change in meaning between the stimulus and the response.

Table 46 shows the semantic proximity means for each subject for each month December to March. A mean score of 4.5 (being the mid point on the scale) was arbitrarily taken as the dividing point and all semantic proximity scores above that were considered "high" scores and all those below that point were considered "low" scores. It will be seen from the table that only one subject (E) scored above 4.5 at any time during the study, and he obtained this score in December. However, in December, two other subjects came close to that score (Subject F with a mean score of 4.3 and Subject J with a mean score of 4.1); two subjects came close to that score in January (Subject B with a mean score of 4.3 and Subject C

with a mean score of 4.4); none came close to that score in March.

TABLE 46

SEMANTIC PROXIMITY (MEANS)

Subject	December	January	February	March
A	3.30	3.97	2.21	2.03
B	2.22	4.35	3.47	2.38
C	3.85	4.40	2.22	1.94
D	1.95	3.00	2.57	2.63
E	4.75*	3.05	3.59	2.57
F	4.31	3.74	3.20	3.05
G	2.31	3.72	3.48	3.65
H	3.73	3.42	2.31	3.30
I	2.40	2.35	3.14	2.81
J	4.15	2.87	4.14	2.60
Range:	1.95 - 4.75	2.35 - 4.40	2.21 - 4.14	1.94-3.65
	2.79	2.04	1.92	1.71

The range of semantic mean scores for the group as a whole was largest in January and smallest in March.

The mean semantic scores for all subjects fluctuated from month to month. No subject showed a definite trend toward an increased or decreased mean score, but six subjects had lower mean scores in March than in December (subjects A, C, E, F, H, J).

A comparison was made between the number of miscues per hundred words made by all subjects from month to month and the increase or decrease in their mean semantic proximity scores. For all of the subjects there was no correspondence, i.e., their semantic proximity scores did not increase with a decrease in their m.p.h.w. Nor were their semantic proximity scores highest when their m.p.h.w. were lowest.

A comparison was made between the amount of variation in the mean proximity scores from month to month for each subject and the stories which they read.

Subject A showed the greatest decrease in his mean semantic proximity score from January to February when he was introduced to the longer stories in Book C. The same pattern appeared in subjects H and J, i.e., they showed their greatest decrease in mean semantic proximity scores when they were first introduced to the longer stories in Book C. Four of the subjects showed their greatest decrease from December to January (subjects B, D, E, G). All were reading more difficult stories in that session than in the previous session and this may have affected their semantic proximity scores, as well as the fact that this session took place shortly after the Christmas holidays. The break could have affected their overall reading efficiency.

Another factor which must be taken into account when considering the low semantic proximity scores of these

subjects is the nature of the stories themselves. All these subjects had been in school for at least two years, but the material they were reading was at the preprimer and primer level. The interest level of the stories, therefore, was geared to younger students. Furthermore, the stories in the Lippincott readers were constructed with a view to close phoneme-grapheme correspondence and many of the words in the text were unlikely to be the ones that would occur in that context in oral language patterns. Therefore, the semantic clues that were present in the story were frequently poor, for example, in the story "The Cats and the Cart" the sentence occurs "the cats harm the eggs." The word "harm" in that context caused a great deal of difficulty and the phrase was usually miscued as "ham and eggs."

Similarly in the story "A Baseball Game" the sentence occurs "Dale made a hit." This was frequently read as "Dale made a run."

The percentage miscues which was coded in each subcategory in this section of the taxonomy was examined for each subject. It was found that in 92.5 per cent of the sessions the majority of miscues had some degree of semantic proximity to the stimuli. However, in 62.5 per cent of the sessions more miscues were coded 0 (i.e., the miscues bore no semantic relationship to the stimuli) than in any other individual subcategory. In December and January only four subjects had more miscues that bore no

semantic relationship to the stimulus than miscues that were coded in any other single subcategory. In February, seven subjects showed this pattern, and in March all the subjects showed this pattern. As these subjects read more difficult stories, they had more difficulty coming up with miscues that bore some relationship semantically to the stimulus.

For the group as a whole, the second highest percentage of miscues were coded in subcategory 7(the response involves a slight change in connotation or a similar name connotation) in 47.5 per cent of the sessions; in subcategory 0(the meaning of the stimulus and the response are unrelated) in 5 per cent of the sessions; in subcategory 2 (the meaning of the response is appropriate but unrelated to the stimulus) in 15 per cent of the sessions and in subcategory 1 (the meaning of the response is vaguely related to context) in 5 per cent of the sessions. In December, two of the subjects had their second highest percentage of miscues coded in subcategory 7; in January four of the subjects showed this pattern; in February five of the subjects and in March, eight of the subjects showed this pattern. It seems, therefore, that although the mean semantic proximity scores remained low throughout the study for the group as a whole, there was a gradual improvement in the quality of their miscues, as measured by their proximity to the stimuli. However, subcategory 9 coded those miscues which did not result in a change of

meaning. In December only one subject had miscues which did not result in a change of meaning (Subject H) and this was the smallest percentage of his miscues (6.66). In January, five subjects produced miscues which did not result in a change of meaning, and the range was from 2.17 - 8.95 per cent. In February eight subjects produced miscues which did not result in a change of meaning and the range was from 1.72 - 6.66 per cent. In March nine subjects produced miscues which did not result in a change of meaning and the range was from 1.6 - 17.77 per cent. Throughout the study, therefore, the percentage of miscues which did not result in a change of meaning remained small--but an increasing number of subjects produced this type of miscue and for the group as a whole the range in percentage of miscues in this category increased.

TABLE 47

COMPARISON BETWEEN MISCUES WHICH DID NOT CHANGE SYNTAX AND MISCUES WHICH DID NOT CHANGE MEANING

Subject	Percentage which did Change Syntax	Percentage which did not Change Meaning
A	42.7	.54
B	27.12	3.68
C	40.69	2.84
D	32.13	.41
E	44.6	.69
F	55.6	4.22
G	41.8	6.62
H	32.7	5.92
I	47.2	2.37
J	47.25	3.49

Table 47 shows that all the subjects had far fewer miscues that changed syntax in some way than meaning. It must be remembered however, that degrees of changes in syntax and meaning were coded and more miscues for each subject had some meaning similarity to the stimuli than no similarity at all.

Summary and Conclusions: Semantic Proximity

1. All the subjects had a majority of miscues which had some semantic proximity to the stimuli rather than no proximity at all.

2. The semantic mean scores for each subject for each session were lower than the syntactic mean scores.

3. The mean semantic scores for each subject fluctuated from month to month. For three subjects the greatest drop in mean score seemed to be related in the length of the story and complexity of sentences. For four subjects the greatest drop in mean score came in the session after the Christmas holidays.

4. The interest level of the stories and the particular choice of words in the readers used in this study could have influenced the semantic means and contributed to the overall low semantic proximity scores for the group as a whole.

5. For the group as a whole, more miscues were coded in subcategory 0 (i.e., they bore no semantic relationship to the stimuli) than in any other category. The number

of subjects showing this particular pattern increased from month to month. At the same time, the second highest percentage of miscues were coded in category 7 (the miscue involved a slight change in connotation); and the number of subjects who showed this particular pattern increased from month to month. Therefore, while the percentage of miscues which bore no semantic relationship to the stimuli remained high throughout the study, the subjects also gave evidence of increasing ability to come up with miscues which had a closer meaning to the stimuli.

6. The number of subjects who were able to come up with miscues that did not change the meaning of the stimuli increased from month to month, as did the range in the percentages within the group. However, the percentage of miscues that did not change the meaning remained small throughout the study, and was always much smaller than the percentage of miscues which did not change the syntax.

XIII. Syntactic and Semantic Acceptability

In these categories of the taxonomy, miscues were examined to determine the degree to which the resulting grammar and resulting meaning of the response was acceptable. The various degrees of acceptability were coded as follows:

1 - Not acceptable

2 - Acceptable only with the prior portion of the sentence.

3 - Acceptable only with the subsequent portion of the sentence.

4 - Acceptable in the sentence, but not in the passage.

5 - Acceptable within the total passage.

Tables 48 and 49 show the percentages of miscues that were coded in each subcategory for each subject, for the two categories. Table 48 shows that for the group as a whole, more miscues had some degree of syntactic acceptability than no acceptability at all. In all instances a higher percentage of miscues was coded in subcategory 5 (miscue is fully acceptable syntactically) than in any other single subcategory.

The percentage of miscues in each subcategory fluctuated upwards and downwards from month to month for each subject. Seven of the subjects had a higher percentage of miscues that were not acceptable syntactically, in March than in December. Four of the subjects had a higher percentage of miscues that were fully acceptable syntactically, in March than in December. The other six had a lower percentage of miscues that were acceptable syntactically in March than in December. It seems that as the stories increased in difficulty, subjects had greater difficulty coming up with miscues that were syntactically acceptable. This is borne out by the pattern shown by six

TABLE 48

SYNTACTIC ACCEPTABILITY (PERCENTAGE)

	December					January					February					March				
Subject	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
A	14.70	2.94	2.94	20.58	58.52	8.69	2.17	2.17	4.34	82.60	28.12	21.87	6.25	12.50	31.25	15.68	33.33	0	1.96	49.01
B	21.56	19.60	0	11.76	7.84	17.91	13.43	1.49	1.49	52.23	18.18	20.00	0	5.45	56.36	28.72	18.08	3.19	1.06	48.93
C	14.28	14.23	0	4.76	66.66	18.75	4.68	0	7.81	64.06	15.51	22.41	0	10.34	51.72	19.44	11.11	5.55	5.55	58.33
D	16.66	35.71	4.76	0	42.85	16.00	20.00	4.00	8.00	52.00	14.06	12.50	4.68	14.06	54.68	23.80	7.93	0	4.76	63.49
E	17.94	15.38	5.12	10.25	53.84	18.91	13.51	0	8.10	59.45	11.26	9.85	1.40	5.63	73.23	17.64	16.47	2.94	2.94	60.29
F	12.50	0	0	18.75	68.75	8.51	2.12	0	10.63	78.72	11.76	7.84	3.92	13.72	62.74	15.38	20.51	0	0	64.10
G	17.64	5.88	0	2.94	73.52	8.42	6.31	2.10	10.52	72.63	13.33	6.66	2.22	2.22	75.55	10.63	18.08	2.12	2.12	67.02
H	6.66	13.33	0	13.33	66.66	28.57	0	0	2.38	69.04	17.24	13.79	0	0	68.96	23.25	6.97	2.32	0	67.44
I	11.42	5.71	0	11.42	71.42	28.30	20.75	0	15.09	35.84	14.89	12.76	0	7.40	68.08	15.90	9.09	2.27	2.27	70.45
J	10.52	10.52	0	5.26	73.68	12.32	17.80	2.73	4.10	63.01	7.14	3.57	0	3.57	85.71	26.52	22.44	0	0	51.02

KEY:
1 Not acceptable
2 Acceptable with what went before
3 Acceptable with what came after
4 Acceptable in sentence but not total context
5 Totally acceptable

of the subjects (B, C, D, E, F, J). The percentage of their miscues which were not acceptable either varied very little or showed a general downward trend from December to February inclusive. Then their percentage of miscues which was not acceptable syntactically increased from February to March. Subject A showed his greatest jump in the percentage of miscues which were not acceptable syntactically from January to February. It has been pointed out previously that in February this subject was introduced to the stories in Book C of the Lippincott series. During this session he showed a downward trend in his reading as measured by many of the categories in this taxonomy.

Table 49 shows that for all the subjects in most of the sessions more miscues were acceptable to some degree semantically than not acceptable at all. In only two instances did the percentage of miscues which were not acceptable syntactically coincide with the percentage of miscues which were not acceptable semantically. In all other instances the percentage of miscues which were not acceptable semantically was higher than the percentage of miscues which was not acceptable syntactically.

Similarly the percentage of miscues which were totally acceptable semantically coincided only twice with the percentage of miscues which were totally acceptable syntactically. In other instances, a higher percentage of miscues were totally acceptable syntactically than seman-

TABLE 49

SEMANTIC ACCEPTABILITY (Percentage)

Subject	December					January					February					March				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
A	29.41	5.88	0	26.47	38.23	32.60	4.34	0	15.21	47.82	59.37	15.62	9.37	12.50	31.25	41.17	37.25	1.96	5.88	13.72
B	31.37	21.56	1.96	31.37	13.72	20.89	10.44	0	14.92	53.73	32.72	20.00	0	14.54	32.72	43.61	18.08	3.19	5.31	29.78
C	14.28	14.28	0	38.09	33.33	31.25	4.68	3.12	10.92	50.00	41.37	20.68	1.72	17.24	18.96	36.11	19.44	5.55	16.16	22.22
D	23.80	33.33	4.76	19.04	19.04	32.00	4.00	0	8.00	56.00	31.25	20.31	9.37	18.75	20.31	31.74	11.11	4.76	19.04	33.33
E	0	30.00	13.33	20.00	36.66	40.54	8.10	0	13.51	37.83	29.57	14.08	2.81	9.85	43.66	35.29	14.70	1.47	8.82	39.70
F	18.75	0	0	68.75	12.50	19.14	8.51	0	29.78	38.29	23.52	21.56	5.88	17.64	31.37	33.33	23.07	0	10.25	33.33
G	38.23	5.88	0	50.00	5.88	20.00	8.42	3.15	35.78	33.68	22.22	15.55	2.22	8.88	51.11	30.85	18.08	3.19	13.82	34.04
H	20.00	6.66	0	20.00	53.33	28.57	4.76	4.76	21.48	40.47	41.37	34.48	0	3.44	20.68	39.53	6.97	4.65	13.95	34.88
I	20.00	17.14	0	25.71	37.14	45.28	1.88	5.66	3.77	43.39	25.53	6.38	0	14.89	53.19	43.81	4.54	0	11.36	40.90
J	10.52	10.52	0	21.05	57.89	35.61	16.48	2.73	12.32	32.87	25.00	7.14	0	14.28	53.57	42.59	22.22	0	14.81	20.37

KEY:
1 not acceptable
2 acceptable with what went before
3 acceptable with what came after
4 acceptable in sentence but not total context
5 totally acceptable

tically.

Tables 50 and 51 summarize the syntactic and semantic acceptability scores for all the subjects for the whole study. It will be seen that the greatest difference between the syntactic and semantic acceptability scores is found in the "not acceptable" and "fully acceptable" categories. A far higher percentage of miscues was not acceptable semantically than syntactically; and a far higher percentage of miscues were fully acceptable syntactically than semantically. However, a higher percentage of miscues was acceptable in the sentence category semantically than syntactically. When the miscue was acceptable semantically, in the sentence only, it was likely to be acceptable syntactically in the passage as a whole. The categories which showed the greatest agreement between syntactic and semantic acceptability were the categories that coded those miscues which were acceptable with either the prior portion of the sentence or with the subsequent portion of the sentence.

Generally, it seems then that these subjects had a relatively strong ability to come up with a syntactically acceptable passage. Their ability to come up with semantically acceptable passages was much weaker--and semantically many of them seemed to be aware of sentences and portions of sentences rather than the total meaning of the passage. However, it should be pointed out all the subjects had a majority of miscues that resulted in material

TABLE 50

SYNTACTIC ACCEPTABILITY CATEGORIES
(Average Percentage for all Sessions)

Subject	Not Acceptable	Acceptable With Prior Portion	Acceptable Only With Subsequent Portion	Acceptable in Sentence	Acceptable in Total Context
A	16.79	15.07	2.84	9.84	55.42
B	21.59	17.77	1.17	4.94	62.13
C	16.99	13.12	1.38	7.11	60.19
D	17.63	19.03	3.36	6.7	53.25
E	16.43	13.72	2.36	6.73	63.38
F	12.03	7.61	.98	10.77	68.57
G	12.50	9.23	1.61	4.45	72.18
H	18.93	8.52	.58	3.92	68.02
I	17.62	12.07	2.27	9.04	61.44
J	14.12	13.58	.68	3.23	68.35

TABLE 51

SEMANTIC ACCEPTABILITY CATEGORIES
(Average Percentage for all Sessions)

Subject	Not Acceptable	Acceptable With Prior Portion	Acceptable Only With Subsequent Portion	Acceptable in Sentence	Fully Acceptable
A	40.63	15.77	2.83	15.01	25.72
B	32.14	17.52	1.28	16.53	32.48
C	30.75	14.77	2.59	20.60	31.12
D	21.8	17.18	4.72	16.20	32.17
E	26.35	16.72	4.4	13.04	39.46
F	23.68	13.28	1.47	31.60	28.87
G	27.82	11.98	2.14	18.17	31.17
H	34.38	13.21	2.35	14.71	37.24
I	46.77	7.48	1.41	13.93	43.65
J	28.40	14.07	.68	15.61	41.17

that was semantically acceptable with either the story as a whole or within a sentence or part of it.

Summary: Semantic and Syntactic Acceptability

1. All the subjects in this study seemed to relate their understanding of syntax and semantics to their reading in that a majority of their miscues were related syntactically and semantically to the reading material.

2. No developmental patterns appeared over the period of this study.

3. All subjects made a much higher percentage of miscues that were totally acceptable syntactically than semantically. All the subjects made a higher percentage of miscues which were not acceptable semantically than syntactically. A higher percentage of miscues were acceptable within the sentence only semantically than syntactically. The closest correspondence between semantic and syntactic acceptability was found in those miscues which were acceptable with the prior portion of the sentence. A small percentage of miscues were acceptable only with the subsequent portion of the sentence.

Comprehension

Ninety-six stories read by the subjects were rated for comprehension. The comprehension scores were obtained from the retelling of the story by the subject as described in Chapter 3.

It is interesting to speculate on the factors involved when comprehension is measured in this way. The subject's ability to recall what he has just read (short term memory) and organize it in a coherent form would influence his performance. Furthermore, a factor labelled arbitrarily, "verbal fluency" (the ability to express oneself clearly and accurately and at suitable length) seems to influence this type of task. The comprehension results for these subjects might have been quite different had specific questions about the stories to direct their thinking been given to the subjects.

All the stories read in this study were at the preprimer, primer and first reader levels. This was the level at which the subjects were working in their classrooms at the time. These subjects were older than Grade I children. It is likely, therefore, that the content of the stories was not at their interest level, and this is a limitation that must be borne in mind when looking at the comprehension ratings.

In this study the subjects were asked "Tell me as much as you can about the story you have just read." and then prompted to think of more by asking them "what happened then?" and other similar open-ended questions. Table 52 shows the comprehension scores for each subject for each month. All subjects except one (Subject I) showed a wide range of comprehension scores and all except the same subject had at least one score at or above 12.5 and

TABLE 52

COMPREHENSION SCORES

Subject	December		January		February		March		Means
A	Cats and Cart:	7	Lin & Bill Get Lost:	10.5	Red Hen:	3	Flop Ears:	10.66	8.2
	Rags & Red:	12	Pet Frog:	8	Fish Tale:	9	Thinking Beggar:	2.33	8.2
			Frank & His Wagon:	12					
B	Rags & Red:	19	Baseball Game:	11.5	Red Hen:	17	Flop Ears:	9	
	Cats & Cart:	12	Pet Frog:	6.0	Fish Tale:	9.66	Pink Swan:	.33	10.74
	Pat & Wagon:	12.5	Little Elephant:	10.5					
C	Pet Dog:	7.5	Frank & His Wagon:	13.5	Hopper Rabbit:	10.33	Don & Nell Dig Clams:	8.5	
	Rags & Red:	18.0	Pet Dog:	13.0	Baseball Game:	6.00	Flat Sam:	11	12.31
	Cats & Cart:	10.5	Hal:	11.5	Kitten & Duck:	12.00			
D	Pet Dog:	11.5	Pet Frog:	8.5	Gardener & His Part:	8	Ted & Rags:	8	
	Rags & Red:	14			The Seal:	9	Pat & the Wagon:	11	10.87
	Cats & Cart:	17							
E	Rags & Red:	12	Frank & His Wagon:	10.5	Hopper Rabbit	6	Red Deer:	11.5	
	Pet Dog:	6.5	Pet Frog:	9.0	Lin & Bill Get Lost:	10	Ted & Rags:	11.5	9.62
							Don & Nell Dig Clams:	9.5	
F	Rags & Red:	13	Frank & His Wagon:	7	Fish Tale:	8	Pink Swan:	5	
	Pet Dog:	2.5	Pet Frog:	3	Red Hen:	7.33	Flop Ears:	6.33	5.96
			Basebaal Game:	1.5					
G	Rags & Red:	16.5	Lin & Bill Get Lost:	13	Flop Ears:	11	Thinking Beggar:	14	
	Pet Dog:	10	Baseball Game:	11	Pink Swan:	12	Hungry Lion:	10	
	Cats & Cart:	13.5	Fish Tale:	11					12.36
			Little Elephant:	14					
H	Pet Dog:	8	Flop Ears:	12.5	Pink Swan:	6	Hungry Lion:	6	
	Rags & Red:	10	Pet Frog:	8	Thinking Beggar:	8	Deer & the Hunter:	6	8.00
	Cats & Cart:	7	Bob & His Bulldog:	8.5					
I	Rags & Red:	8			Frank & His Wagon:	9.5	Ted & Rags:	6	6.50
	Pet Dog:	4			Pet Frog:	3.5	Cats & Cart:	8	
J	Rags & Red:	10	Pet Frog:	8.5	Baseball Game:	7	Ben Finds Flop Ears:	11	
	Cats & Cart:	1.5	Lin & Bill Get Lost	7.0	Fish Tale:	13	Flop Ears:	13	8.13
	Pet Dog:	7	Frank & His Wagon:	3.5			Pink Swan:	8	
Mean:		10.40		9.32		8.53		8.88	9.43

one score below that.

Subject I's scores ranged from 3.5 - 9.5 and he obtained both these scores during the February session. His comprehension scores were compared with the m.p.h.w. which he made in the stories he read in December and February. Of the four stories he made the fewest m.p.h.w. in the story "Frank and His Wagon" (19 m.p.h.w.) and his comprehension scores was highest for this story too, (9.5). However, he had 28 m.p.h.w. when he read the story "Pet Frog" for which his comprehension score was 3.5 and 36 m.p.h.w. when he read the story "Rags and Red" for which his comprehension score was 8. Factors other than m.p.h.w. seem to have affected this subject's comprehension score.

Only two subjects had more comprehension scores above 12.5 than below (Subjects B and G) and each had a characteristic pattern. Both seemed more fluent than the other subjects, i.e., they retold their stories at greater length and with greater ease and better organization than the other subjects. Subject B was particularly strong in inference and interpretation and in the use of the pictures to obtain information about the story. Subject G, on the other hand, was meticulous about details of the stories he had read.

The range of comprehension scores obtained by each subject is difficult to explain and factors such as concentration, attention span and story interest doubtless influenced the performance of these subjects. However,

most subjects had a lower comprehension score in March than in December. It could be that memory for longer stories affected their scores.

The subjects' scores on the same stories were compared to determine whether these subjects consistently found certain stories easier to retell than others.

Subject D got his highest comprehension score when he read the story "The Cats and the Cart" in December. This was not so for any other subject who read that story. He made 20 m.p.h.w. while reading that story and 15 m.p.h.w. while reading "Rags and Red" for which his comprehension rating was 14. While reading "The Cats and the Cart" this subject examined the pictures very carefully and seemed to integrate the information he obtained from the pictures with that from the reading. For example, he noticed the price tag on the eggs and made the inference that he was trying to sell his eggs; he inferred too, that the cats had strayed to the cart from the surrounding neighbourhood. However, he did not seem able to do this as successfully with the other stories that he read.

Ten subjects read the story "Rags and Red" in December, and eight subjects obtained their highest score of comprehension during the retelling of this story. From the writer's subjective point of view this did not seem more interesting a story than the others these subjects read. However, the subjects seemed to enjoy it and were particularly able to use the pictures to fill in the mean-

ing of the story. Two of the subjects (H and J) obtained their highest comprehension rating on the story "Flop Ears" and Subject A obtained his second highest comprehension rating on this story.

Subjects F and G obtained their lowest comprehension rating in December for "The Pet Dog." Subject G retold the details of the story well and in correct sequence, but made no inferences nor did he use the pictures to fill in the story. Subject F retold all his stories except one (Rags and Red) very briefly. In retelling this story he recounted three facts and could not be stimulated to tell anything more about the story. He followed this same pattern throughout the study. It was noticed during the study that this subject was a particularly careful word analyzer. When he came to a word that he did not recognize immediately, he would pause and carefully and laboriously sound it out. Often the pause was lengthy as he persisted in his efforts to analyze the word. It is possible that by the time he had completed the story, in this way, he had forgotten what he was reading about. It is also possible that he was focussing on this aspect of reading to the detriment of the meaning aspects of his reading. Beyond this no consistency was found in the comprehension of specific stories by different subjects.

As mentioned previously, fluency in retelling the story was not measured specifically in this study. However, a difference in the ease and the length with which

stories were retold was noticed between subjects.

Subjects B and G, for example, retold stories at length, were able to organize their thoughts and their sentences and needed no persuading to do so. Subjects F and I retold their stories extremely briefly, usually retelling only isolated facts and not relating them to one another. They would insist that they could not recall anything further from the story.

The subjects were scored for the accuracy of sequence in their retelling. It was noticed that in the retelling of all the subjects except two (B and G), there was almost a complete absence of the use of words that expressed sequence, for example, then, while, before, etc. Their sentences were usually simple statements. For most subjects, the lowest scores on the subcategories of the comprehension key were obtained for the sequence with which they recalled the story.

Summary: Comprehension

1. All subjects read with some degree of comprehension regardless of the m.p.h.w. made.

2. Some subjects were able to integrate information from the written material and from the pictures in the story, for comprehension purposes, better than others.

3. A majority of subjects found one story used in

this study easier to comprehend than any other. Generally, however, subjects differed in their preference for stories, as measured by their comprehension ratings.

4. Factors such as the content and interest level of the reading material and the interests of the subjects, as well as short term memory for sequence might have affected the comprehension ratings of these subjects.

Summary: Group Patterning of Performance--Oral Reading

In this section, patterns of reading performance that emerged for the group as a whole from the analysis of their oral reading miscues will be discussed.

First, patterns that were identified for the group as a whole within each category and between certain categories of the taxonomy will be summarized and discussed. Then, overall patterns of performance that emerged for the group as a whole will be discussed in relation to the three main cue systems operating in reading (K. Goodman, 1969), namely the grapho-phonic, syntactic, and semantic.

To show the patterns of performance in oral reading, bar graphs were constructed for each subject. The data collated on these graphs were those obtained in December (at the beginning of the study) and in March (at the end of the study) in the following categories:

I - Miscues Per Hundred Words

II - Percentage Attempted Corrections of Miscues

III - Percentage of Miscues in the Periphery (Near field)

IV - Percentage Habitual Associations

V - Graphic Proximity

VI - Phonemic Proximity

VII - Syntactic Proximity

VIII - Semantic Proximity

IX - Syntactic Acceptability

X - Semantic Acceptability

These categories were selected as representative of the categories that yielded information about grapho-phonic, syntactic and semantic processing. The graphs for each subject are shown in Figures 12 to 21 in Appendix B.

Information relating to subcategories within the main categories above were discussed in the previous section and were not considered here.

Patterns of Performance Within Each Category

1. Miscues Per Hundred Words

There was fluctuation upwards and downwards in the number of miscues per hundred words made by each subject from session to session. But when the number of m.p.h.w. made by each subject in March was compared to the number of m.p.h.w. made in December, it was found that six subjects made fewer m.p.h.w. in March than in December,

though they read more difficult material during the last session. One subject made the same number of miscues per hundred words in December as in March, when he was reading more difficult material. Seven of the subjects, then, seemed to be reading with greater efficiency when judged solely by the number of m.p.h.w.

However, the qualitative analysis of the miscues yielded more information about the effectiveness of these subjects' reading than did the quantitative analysis.

2. Miscues Corrected

All subjects made no attempt to correct the vast majority of miscues at the time the stimulus was miscued initially. When an attempt was made to correct a miscue, it was successful in the majority of instances. The question remains: What determined correcting behaviour in some instances and not in others? The number of miscues per hundred words did not influence correcting behaviour in the majority of instances. It could be, that only on those occasions when correcting behaviour occurred were the subjects processing enough language information to make them aware that their response was a miscue. On the other hand, it may be that these subjects tended to avoid correcting behaviour even when they were aware of the fact that they had miscued. They had experienced several years of failure in reading, may not have expected success as they read, and, therefore, seldom attempted to

correct miscues.

For six subjects, their lowest percentage of miscues per hundred words was accompanied by their highest percentage of attempts at correction. For the group as a whole, however, the coefficient of correlation between the miscues per hundred words and the percentage of miscues for which corrections were attempted was .02. Factors other than the number of miscues per hundred words influenced the percentage of miscues for which a correction was attempted. The possible influence of attitude and habit on attempts to correct was discussed above.

Nine of the subjects attempted to correct a larger percentage of miscues in December than in March. In December, the stories that they read were shorter, and were written in shorter sentences than the stories written in March. It could be that these subjects found it easier to process information and integrate it over shorter language units--hence they were more aware of the miscues that they made and attempted corrections more frequently.

3. <u>Instance of Identification</u>

In most sessions more than half the miscues were identified correctly at some time during the reading of the story, by the majority of the subjects. Subsequent corrections of miscued items took place most often the very next time the item occurred in the story.

All the subjects, at the majority of sessions (87.5 per cent) had a percentage of miscues of items that had been identified correctly earlier in the story. In most of these cases, these types of miscues seemed to be due to the unstable nature of the sound/symbol relationship for these boys,and/or to their unstable memory for the word, or the sounds within words.

These particular miscues seldom seemed due to a different or unusual use of the word in the story. All ten subjects often failed to recognize words they had identified correctly earlier in the story in very similar contexts.

4. Observed Response in the Periphery

In December and in March, all subjects had a percentage of miscues that could have been responses to visual cues in the periphery. However, nine of the subjects had a higher percentage of miscues coded in this category in December than in March. This seemed to indicate an improved ability on the part of these boys to process visual cues in sequence while reading. However, for all the boys, a small percentage of miscues in March could still have been the result of difficulty in processing graphic cues in sequence.

5. Habitual Associations

All subjects had a percentage of miscues that became

habitual associations during the reading of the stories. Six subjects had a higher percentage of miscues in this category in March than in December.

The percentage of habitual associations in a subject's reading seemed to depend on the content of the story. A large number of the stories used in this study contained proper names of characters--and the names were often uncommon ones. In order to read these correctly the subjects could rely only on their ability to analyze the words into their component sounds and then blend them. If they were unable to do this successfully they miscued the name and continued to do so each time the name occurred in the story.

Miscued responses that could be corrected by using other language cues did not become habitual associations as often as proper names.

6. Graphic Proximity of the Stimulus and the Response

The graphic means for each subject varied from session to session. Seven subjects showed a drop in graphic proximity means from December to March.

The majority of miscues bore some graphic similarity to the stimuli in each month for each subject. Most frequently, the stimulus and the response ressembled each other in initial graphemes and after that the stimulus and response differed from one another most frequently in one consonant grapheme only.

7. Phonemic Proximity of the Stimulus and the Response

The phonemic means for each subject varied from session to session. Five subjects showed a drop in phonemic means from December to March.

In 37.5 per cent of the sessions more miscues bore no phonemic resemblance to the stimulus than some resemblance. The stimulus and the miscue more frequently resembled each other in initial phonemes than in any other phonemes.

Relationship between Phonemic and Graphic Proximity Means

For nine of the subjects, the graphic mean was higher than the phonemic mean. This was true in December and in March. It seemed that miscued responses would bear a closer graphic resemblance to the stimulus than phonemic resemblance. The subjects seemed to be able to process graphic information more efficiently than phonemic information.

For the group as a whole there was a decline in the range of graphic and phonemic scores from December to March. The widest range in these scores and the highest mean phonemic and graphic proximity scores occurred in December. The lowest range in graphic proximity scores was found in March; for phonemic proximity scores the lowest range was found in February. There was less change in the range of phonemic proximity scores, however, than in the range of graphic mean scores.

The narrowing of the range of scores obtained by the group could have been due, in part, to the organization of the class for teaching purposes in the first few months of the school year. All ten subjects were taught together as one group and for those subjects with relatively high graphic and phonemic proximity scores in December, this could have meant review of phonic generalizations with which they were already familiar. The other subjects, perhaps were just beginning to establish those generalizations.

However, an examination of the coefficients of correlation between graphic proximity means and phonemic proximity means for December and March for the group as a whole is interesting. This is shown in Table 53.

TABLE 53

COEFFICIENTS OF CORRELATION BETWEEN GRAPHIC AND PHONEMIC PROXIMITY MEANS

December	.64
March	.90

It shows that these subjects had developed a stronger ability to relate phonemic and graphic information by the end of the study, and this too could account for the narrowing of the range of graphic and phonemic proximity scores.

8. Grammatical Function of the Stimulus and the Response

Generally the miscued responses tended to be of the same grammatical category as the stimuli. The ability to substitute words in the same category as the stimuli was pronounced in the first session and remained so throughout the period of the study. The strongest categories were nouns, function words and verbs and agreement was lowest for the adverb category for all subjects.

It seems that the ability to process syntactic information was generally very well developed in these ten children. Adverbs were more difficult for these ten subjects to manipulate accurately--perhaps because of the moveable nature of the adverb in the English grammatical system.

9. Levels of Language

Throughout the period of this study the vast majority of miscues were at the word level, followed first by miscues at the submorphemic level, and then by miscues at the bound morpheme level. Miscues involving phrases or sentences became noticeable toward the end of the study but were a very small percentage of the total number of miscues.

There seemed to be an increased awareness of, and ability to handle inflectional suffixes in reading as the

study progressed.

The highest percentage of miscues were substitutions at all levels except at the phrase and sentence level. A small percentage of miscues were reversals and of these most were found at the phrase and submorphemic level.

10. Syntactic Proximity

A large majority of the miscues made by all the subjects bore some degree of syntactic proximity to the stimulus. This was true for the entire period of the study. However, these subjects showed a drop in their syntactic proximity scores during the session when they were first introduced to longer stories containing more complex sentences.

It seems therefore that these subjects were generally able to process syntactic information very well. However, they were not as efficient in processing such information when longer and more complex units of language were involved. This is corroborated by the fact that nine of the subjects showed a drop in their syntactic proximity scores in March as compared to their December scores in this category.

11. Semantic Proximity

The semantic proximity mean was low for all subjects in December and in March--it was the lowest score obtained

by all subjects in relation to the other syntactic and semantic categories. Mean scores fluctuated from month to month and no developmental trend could be discerned. However, eight of the boys had lower semantic mean scores in March than in December. It was difficult to determine the reason for this fluctuation. It is possible, however, that the interest level of the stories accounted in part for this fluctuation. Although all the boys were over nine years old, they were reading material designed for use at a grade one and beginning grade two level. In addition, the particular choice of words in the stories could have accounted for the low semantic proximity scores. In choosing the words to use in the stories, prime consideration seemed to have been given to grapheme-phoneme correspondence rather than to the frequency with which children would use that word in that particular situation.

Relationship Between Syntactic and Semantic Proximity Scores

For every subject, the semantic mean scores were always lower than the syntactic mean scores.

The relationship between the syntactic and semantic proximity mean scores as shown on the bar graphs tended to remain the same in March as in December.

12. Syntactic and Semantic Acceptability

For nine subjects, a higher percentage of miscues were coded in the "syntactically fully acceptable" category

than in any other category in the taxonomy.

For eight of the subjects in December, and for all the subjects in March, there was a higher percentage of miscues that was syntactically acceptable than semantically acceptable. The difference between the scores of syntactic and semantic acceptability was greater in March than in December for the majority of the subjects. The boys did not seem to be improving in their ability to integrate syntactic and semantic information. In fact a comparison of their scores on the bar graphs shows that they seemed better able to do this in December than in March. Once again, the difference in the story material used in these two months could account for the inability of these students to integrate information while reading. When they were reading longer stories involving more complex material syntactically and semantically they were not able to integrate information from all systems as well as when they were reading shorter and less complex stories.

Relationship between the Percentage of Phonemic and Graphic Proximity and the Percentage of Semantic and Syntactic Acceptability.

To determine the relationship between these categories the coefficients of correlation were calculated for December and March and the results are shown in Table 54. It shows that in December there was a significant relationship between graphic proximity scores and syntactic acceptability, between phonemic proximity scores and

semantic acceptability and a relationship, though less significant between phonemic proximity and syntactic acceptability. In March, none of these relationships were significant.

TABLE 54

COEFFICIENT OF CORRELATION BETWEEN GRAPHIC AND PHONEMIC PROXIMITY AND SYNTACTIC AND SEMANTIC ACCEPTABILITY

	Graphic Proximity to Semantic Acceptability	Graphic Proximity to Syntactic Acceptability	Phonemic Proximity to Semantic Acceptability	Phonemic Proximity to Syntactic Acceptability
December	.234	.618	.782	.445
March	.243	.256	.293	.007

It seems that in December, these subjects were integrating phonemic and graphic information with syntactic and semantic information more successfully than in March. This despite the fact that in March there was a high correlation between phonemic and graphic proximity scores obtained by these subjects.

It seems that as these ten boys became more efficient in integrating the phonemic and graphic cue systems they became less efficient in their ability to integrate them with the semantic and syntactic cue systems.

Patterns of Performance in Relation to Cue Systems

In this section the data will be discussed in relation to the three cue systems operating to cue a reader while reading: the grapho-phonic, syntactic and semantic.

1. Grapho-Phonic

At the beginning of the study, the ten subjects were more aware of the graphic information than of the phonemic information in reading. There was a significant relationship between the two systems as the boys read in December but the relationship was much higher in March. It seems that these boys had made progress in integrating their knowledge of these two systems.

The lower percentage of miscues made by these subjects at the end of the study, that could have been due to stimuli in the periphery indicates, too, increasing efficiency in processing graphic cues in sequence.

However, the quantity of their knowledge of the two systems had not grown from December to March. These ten subjects continued to show a percentage of miscues that became habitual associations during the reading of the story. It has been pointed out that the words that became habitual associations were often those that required accurate word analysis skills since no other language cues were available to help the reader.

Graphic and phonemic proximity scores individually declined from December to March for the majority of the subjects. Several reasons could account for the decline in these scores: firstly, the sequence of phonic generalizations introduced in the classroom was not the same as the sequence of phonic generalizations introduced in the readers used in this study. Secondly, the organization of the classroom which allowed for all boys to be taught as a single group at first and which started with basic review of phoneme-grapheme correspondence could have caused the narrowing of the range of scores in each category. Thirdly, it could be that a decline in phonemic and graphic proximity scores was an inevitable counterpart of more careful integration of the two systems; had the study continued for a longer period of time, these skills might have shown further development.

2. Syntactic Information

The analysis of miscues showed that these ten boys were very aware of the grammatical structures of the language and were able to use this knowledge while reading. Thus a high percentage of the substituted words were of the same grammatical category as the stimuli. The syntactic proximity means for the miscues were high from the beginning relative to the other categories, showing an awareness of the grammatical structure of the material

they were reading on the part of these subjects.

However, there was some evidence that the efficiency of the subjects' processing of syntactic information was limited by certain factors, namely:

a) the length of the sentences and the complexity of sentence structure. All the boys showed a drop in their syntactic proximity means in March as compared to December. They all read more difficult material in March than in December. It could be that they were unable to process information as efficiently over more complex units of language.

b) the grammatical categories of the words used:

i) These ten boys had the most difficulty coming up with an adjective response for an adjective stimulus and an adverb response for an adverb stimulus.

The stories used in this study had a relatively low percentage of adverbs and adjectives. Had stories been used which had a greater number of sentences with verbs and adverbs, these boys might not have had such high syntactic proximity scores.

ii) Five of the subjects had a greater percentage of verb miscues than could have been expected from the distribution of that category in the stories that they read. Sentence patterns that started with verbs particularly gave them difficulty and

their syntactic processing did not seem to be flexible enough to take account of sentence patterns of this type.

3. Semantic Information

Semantic processing was weaker than syntactic processing for all subjects. Again, a decrease in semantic proximity and semantic acceptability scores was evident from December to March for all subjects.

The subjects were aware of the semantic component while they were reading--this is shown by the fact that the subjects all had a percentage of miscues which were semantically acceptable. When these percentages were compared to the percentages that represented the degree of semantic approximation between the miscue and the response, it was found that the former were always higher than the latter.

In other words, very often the subjects came up with a semantically acceptable response in the context of the sentence being read or of the sentence that had been read previously. However, this meaning did not necessarily bear a close relationship to the meaning of the written passage.

Summary

It seems therefore that the ten boys in this study were

most efficient at processing syntactic information. As they grew in their ability to integrate the graphic and phonemic information they did not grow in their ability to integrate this information with the syntactic and semantic information while reading.

The major pattern that emerged, then, during the four months study is one of increasing ability to integrate the graphic and phonemic cue systems while reading, with decreasing ability to integrate these with syntactic and semantic information contained in the reading material. It could be that as these boys concentrated on the relationship between phonemic and graphic information they were unable to encompass the other cue systems too.

CHAPTER VI

FINDINGS: RELATIONSHIP BETWEEN AUDITORY PERCEPTUAL PATTERNS AND ORAL READING PATTERNS

It was the purpose of this chapter to compare group patterns of performance on the auditory perceptual tests and group patterns of performance that emerged from the analysis of the oral reading miscues.

The results of the various auditory perceptual tests were reported in a number of different ways, among them reading ages, percentiles, and raw scores. The results on the taxonomy were reported as percentages, or mean scores on a scale and represented different types of performance. An attempt was made to compare individual auditory test results and results on individual categories of the taxonomy or groups of categories of the taxonomy. However, the results obtained in this way proved to be misleading since error percentages on the tests and percentages on categories in the taxonomy were really not comparable from the standpoint of performance. Furthermore, miscues were never coded in only one section of the taxonomy and it was the relationship between results on different categories of the taxonomy and between results on different aspects of auditory perception that emerged as significant for the group.

This would not be shown on graphs that attempted to show relationships between individual auditory perception tests and individual items of the taxonomy.

Because of these difficulties, it was decided to discuss the similarities that emerged between total patterns of performance on auditory perception and total patterns of performance on oral reading for the whole group and the possible relationship between the two.

Firstly, an overview of the patterns of performance for oral reading that emerged for the group as a whole will be given. This has been discussed in greater detail in Chapter V of the study. Then an overview of the patterns of performance in auditory perception that emerged for the group as a whole will be given. This was discussed in greater detail in Chapter IV of the study.

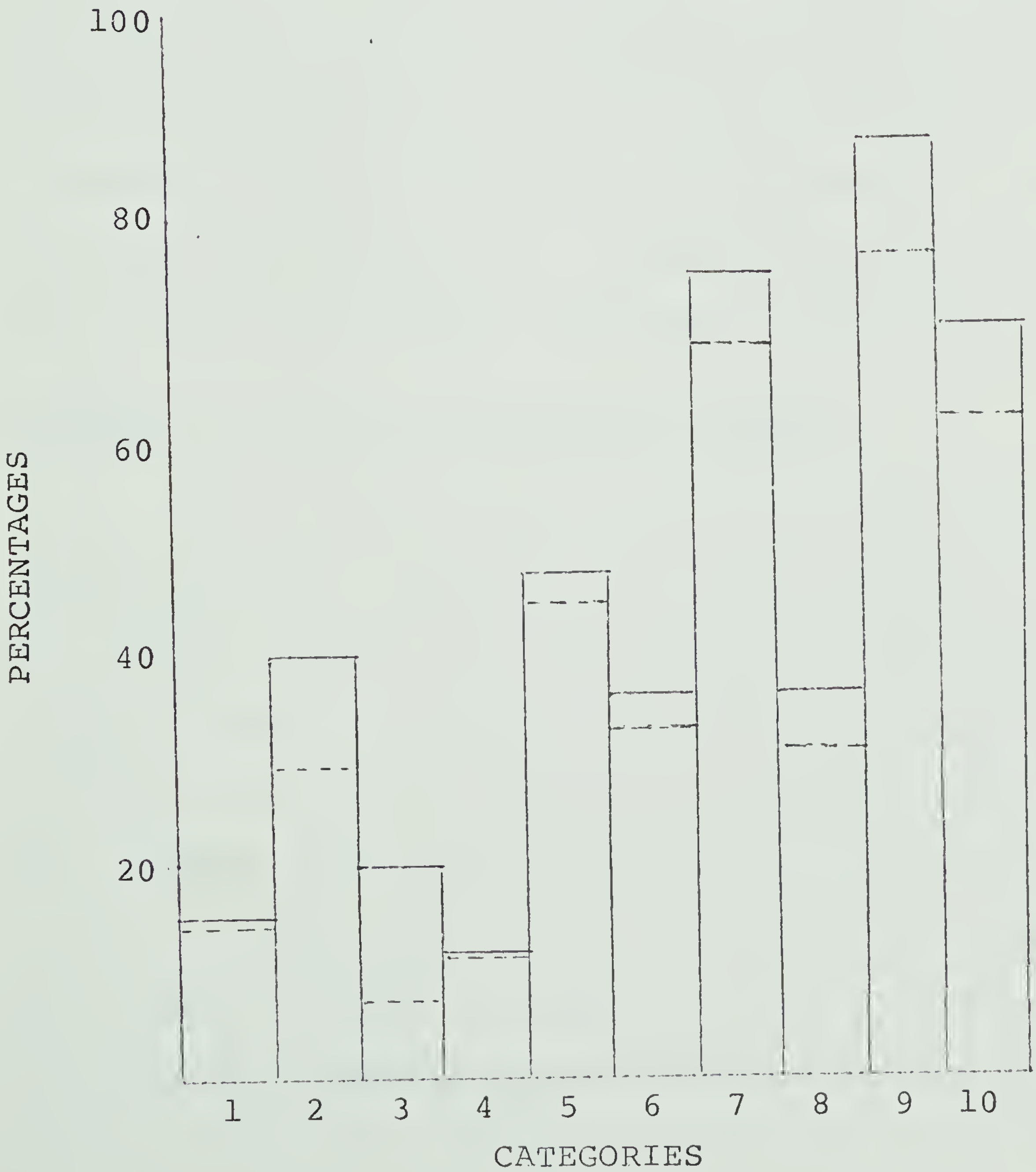
Overview: Oral Reading Patterns

The pattern of performance for oral reading that emerged for the group as a whole in December and March is shown in Figure 22. When the syntactic and semantic processing categories were considered, it was found that for the group as a whole syntactic processing was more efficient than semantic processing. When the semantic aspects only were considered it was found that for the group as a whole, a percentage of miscues were semantically acceptable but they bore a low semantic approximation to the meaning of the written material.

Figure 22: ORAL READING PATTERNS (WHOLE GROUP--December, March)

1. Miscues per Hundred Words
2. Percentage Attempts at Correction
3. Percentage Miscues in Periphery
4. Habitual Associations
5. Graphic Proximity
6. Phonemic Proximity
7. Syntactic Proximity
8. Semantic Proximity
9. Syntactic Acceptability
10. Semantic Acceptability

KEY:
____ December
---- March



When phonemic and graphic processing were considered it was found that for the group as a whole, processing of graphic information was more efficient than processing of phonemic information and the efficiency declined from December to March. The fact that the relationship between these two aspects became closer has been discussed elsewhere in this thesis.

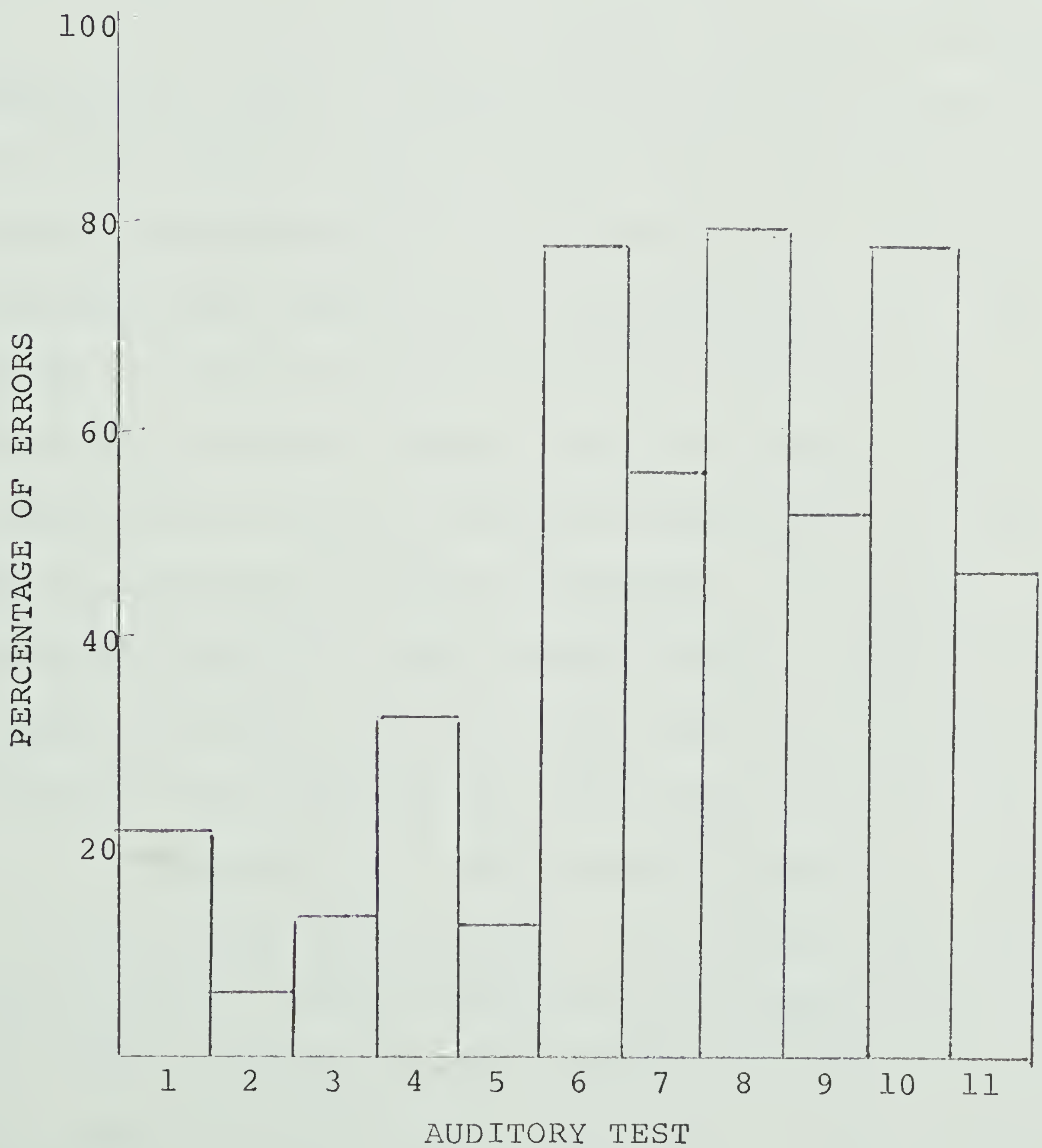
When the semantic, syntactic and grapho-phonic categories were considered together, it was found that the group as a whole was relatively weak in processing graphic, phonemic and semantic information and strong in processing syntactic information. In all three categories the group showed a decline in efficiency from December to March, although they did show an increasing ability to integrate the graphic and phonemic information while reading.

Overview: Auditory Perceptual Patterns

The pattern of performance in auditory perception that emerged for the group as a whole is shown in Figure 23. It can be seen that the group as a whole showed relative strength in auditory discrimination and auditory blending and relative weakness in auditory memory. Within the auditory discrimination tests it can be seen that the group as a whole was weakest on the test that required the subjects to hold a sequence in mind while performing an operation (orientation and discrimination test). Similarly, within the auditory memory tests, the group as a

Figure 23: AUDITORY PERCEPTUAL PATTERNS (WHOLE GROUP)

1. Wepman - 1st testing
2. Wepman - last testing
3. Fast-Cosens
4. Monroe-Sherman--Orientation & Discrimination
5. Roswell-Chall--Auditory Blending
6. Monroe-Sherman Letter Memory
7. Rogers - Letters Forward
8. - Letters Backward
9. - Digits Forward
10. - Digits Backward
11. Detroit - Unrelated Words



whole were poorest on the tests that required them to hold sequences in mind while performing operations (letters and digits backwards and letter memory where a written response was required). They were strongest in the test that required them simply to remember items from a group heard, without any attention to the sequence in which they were presented (memory for unrelated words).

It is fruitful to consider the likely effects this weak auditory memory shown by the group as a whole had upon the processes which contributed to their reading competency.

It is established that for all normal children the reading and writing process is an extension of the listening and speaking communication. The development of the latter occurs during the pre school years. Necessary to listening and speaking are the development over time of a stock of concepts and a vocabulary associated with these concepts. Auditory memory and visual memory then would be important in concept information--and both long term and short term memory would be involved. For example, when a child is learning a new word the correct holding of the sequence of sounds involved in his short term memory would be crucial to his ability to repeat the word correctly.

The group as a whole showed weakness in the semantic processing while reading. It could be that their general level of concept formation and vocabulary was poor and that his affected their ability to process the semantic information from the printed page. While reading, a

reader has to utilize his experiential and conceptual background to create a meaning context. If he lacks this background, or if it is impoverished he cannot supply this meaning component and he reads with diminished competence.

In the decoding process in reading it has been suggested that both long term and short term memory are involved. When the child is faced with a visual printed stimulus he may react to the total configuration and recall the spoken word that is associated with it. If he does not or cannot do this, he may attempt to associate individual graphemes with their corresponding phonemes. He would need to hold each phoneme in mind in correct sequence and then blend the sequence of phonemes into the whole word. Long term memory is involved in the recall of the phoneme associated with the grapheme and short term memory is involved in holding the sequence of sounds in mind while analyzing and then blending.

The group as a whole showed relative strength in the auditory blending tests administered in this study. It has been pointed out elsewhere, that the task required on these tests differs from the task required in reading in that the sounds are presented to the subject by another person in the auditory blending test. In the reading act the additional tasks of associating sounds with symbols and holding them in mind while performing an operation are involved.

The group as a whole showed relative weakness in processing phonemic and graphic information. It could be that this weakness was related to their weak short term auditory memory and this could account for the fact too, that they showed little growth in their knowledge of phoneme-grapheme correspondences. With weak auditory memories, they would take longer than children of the same age and intelligence to establish these.

It is accepted that adequate auditory discrimination is an important factor in the development of efficient word attack skills. By the time this study took place all the subjects had relatively adequate auditory discrimination, but there was evidence for the majority of the subjects that their auditory discrimination had been inadequate during the early part of their school careers. It could be then, that at the age when most children are introduced to phoneme-grapheme correspondences these children's weak auditory discrimination hampered them in the development of these skills.

Short term memory is also involved in the reconstructing of meaning of a sentence from its parts and of a passage from its component sentences. Thus Gray (1960, p.9) observes:

> "As meaning associations are aroused they are fused into a sequence of ideas. To do this the good reader holds in mind the meanings of the first words of a sentence until those that follow are recognized."

In reconstructing the overall meaning of a passage, similarly, accurate holding in mind and recall of a se-

quence of ideas is important.

The subjects in this study all showed weaknesses in semantic processing and it is possible that their weak auditory memories affected this aspect of the reading process. This contention is further supported by the fact that the group as a whole were weaker in processing semantic information in March than in December. In March they were reading longer stories, with more complex sentences and it could be that they had more difficulty holding longer sequences in mind. Further evidence of the type of difficulty that they had is obtained by examining their scores in the 'semantic acceptability' category. The bar graph shows their average score for miscues with some degree of acceptability. In the discussion, earlier in this thesis, it was pointed out that generally the group as a whole was more aware semantically of sentences, or parts of sentences than of the meaning of the total passage. This seems to provide additional evidence that for the group as a whole weak auditory memory affected their ability to process semantic information.

Summary

It has been suggested that both long and short term memory affect parts of the reading process as follows:

a) when the reader is associating the oral word with

its graphic configuration, or when he is holding a sequence of phonemes in mind and then blending them into words;

b) when a reader is holding a sequence of words in mind while arriving at the meaning of the sentence;

c) when the reader is holding a sequence of ideas in a passage in mind while arriving at the total meaning of the passage.

In addition, short and long term auditory memory affect the development of speech and language in the pre-school and school age years and these concepts and vocabulary are the foundation upon which reading skills are built.

It was noted that it was precisely in those areas of the reading process most affected by short and long term memory that this group of dyslexic boys showed the greatest weakness. This strengthens the probability that in this group of dyslexic boys the difficulties they experienced in reading were closely related to their patterns of auditory perception.

CHAPTER VII

SUMMARY OF FINDINGS, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

Summary of the Study

This study was designed as a clinical study of ten dyslexic boys. Its aims were to determine what patterns of auditory perception emerged for the group as a whole, and what patterns of oral reading performance emerged for the group as a whole from an analysis of their oral reading miscues. Finally, it attempted to find what patterns of performance emerged between the two.

In order to do this a number of tests designed to measure the auditory discrimination, auditory blending and auditory memory aspects of auditory perception were selected. They were administered to a group of ten boys in a class for dyslexics in the Edmonton Public School System. In addition, samples of their oral reading were collected at monthly intervals over a period of four months. The miscues made by these boys in their oral reading were analyzed using selected categories of Goodman's Taxonomy of Cues and Miscues in Reading (K. Goodman, 1969). This taxonomy provides information about the way in which a reader is processing grapho-

phonic, syntactic and semantic information in reading, through an analysis of oral reading miscues.

The results of the auditory perceptual tests were compiled and the data were compared in order to observe patterns of performance for each separate test that emerged for the group as a whole. For individual tests, this was done by converting raw scores into percentile ranks or age equivalents using the publishers norms. For other tests, raw scores had to be used since no norms were available. Error scores were converted into percentages and these percentages were compared.

The results of the analysis of oral reading miscues using Goodman's taxonomy (1969) were totalled for each subject for each category in each month and percentages were computed. Simple correlations between results obtained on certain categories of the taxonomy were computed to determine the relationship between these.

In order to examine the patterns of performance that emerged for the group as a whole results from certain categories of the taxonomy for each subject were collated on bar graphs. The categories selected for this graphic depiction were chosen on the basis that they gave representative information about the three types of information processing with which this study was concerned. In order to determine whether patterns of change occurred for the group as a whole, results obtained by the subjects

in these categories in December and in March were used. To determine patterns of relationship between auditory perceptual abilities and oral reading performance, the patterns of relationship that emerged for the group as a whole on the auditory perceptual tasks were compared with the patterns of relationship that emerged for the group as a whole from the analysis of their oral reading miscues. Again, the categories from the taxonomy chosen for this purpose were selected as giving representative information about the grapho-phonic, syntactic and semantic processing of these subjects while reading.

Summary of Findings

Auditory Perception

For the group as a whole the following were the most significant findings:

1. By the time this study took place all ten subjects had adequate auditory discrimination (as measured on tests using minimal pairs) and auditory blending.

2. Records of the majority of the subjects indicated that they had had inadequate auditory discrimination earlier in their school careers. Similar development data on auditory blending and auditory memory were not available from the files.

3. The majority obtained an inferior ranking on an auditory discrimination task that combined visual and auditory requirements.

4. For the group as a whole, the easiest sound contrasts were fricative/affricate, and the most difficult were nasals. Voiced sounds were more difficult than voiceless sounds in final position, and sounds in the final position were the most difficult to discriminate. Medial sounds were the easiest. The group as a whole found it more difficult to hear similarities rather than differences in words.

5. All ten subjects had poor auditory memory compared to auditory discrimination and auditory blending ability. On the auditory memory tests for which norms were available, the amount of retardation for the group as a whole ranged from 1.1 - 4.7 years.

Within the auditory memory tests all subjects had the greatest difficulty either on the tests of memory for letters and digits backward or on the test for letter memory which involved remembering and then writing a sequence of letters.

Oral Reading

All subjects showed variations in their oral reading upwards and downwards, in their performance from month to month. However, when the results obtained in December were compared with the results obtained in March it seemed as if some trends were beginning to be established. The findings will be summarized in relation to the use of grapho-phonic syntactic and semantic information.

1. Grapho-Phonic:- For the group as a whole the abil-

ity to integrate graphic and phonemic information was high at the beginning of the study and became higher still at the end of the study. However, this improved ability to integrate still existed beside a relatively small quantity of knowledge of phonic generalizations.

2. Syntactic Information:- The ability of the group as a whole to process syntactic information was strongly developed at the beginning of the study, and remained so throughout. However, the ability of the group to integrate syntactic and semantic information was low. The ability of the group to relate graphic information to syntactic information and phonemic information to semantic information was high in December, at the beginning of the study, but low in March, at the end of the study.

3. Semantic Information:- The ability to process semantic information while reading seemed the poorest developed for the group as a whole when compared with their ability to process syntactic and grapho-phonic information.

The group as a whole seemed aware of meaning while reading--but seemed unable to relate the meaning of the story material and information from the grapho-phonic system. Thus, the relationship between graphic proximity and semantic acceptability remained as low in March as in December. There was a decline in the relationship between phonemic proximity and semantic acceptability between December and March.

Relationship Between Auditory Perceptual Patterns and Oral Reading Patterns for the Group as a Whole

When a comparison of group patterns of performance on auditory perceptual tests was made with group patterns of oral reading performance it was found that it was in those areas of the reading process most affected by short term memory that this group of dyslexic boys showed the greatest weakness, namely, in the processing of grapho-phonemic and semantic information.

Conclusions

Each question posed at the beginning of this study will be discussed in the light of the findings:

Question 1: Are there patterns of auditory perception that emerge for the group as a whole?

When the performance of individual subjects was studied in relation to the percentage of errors made on each of the auditory perceptual tests, it was found that all the subjects had a wide discrepancy of errors as between the auditory discrimination and auditory blending tests on the one hand and the auditory memory tests on the other. The subjects performed well on the auditory discrimination and blending tests and poorly on the auditory memory tests. Furthermore, it was found that all the subjects had the highest percentage of errors on those auditory tests which required them to hold a

sequence in mind and then perform an operation on it; for example, the test of auditory letter memory that required a written response, the tests of auditory memory that required the subjects to repeat a sequence in reversed order, and the test of auditory discrimination that required memory of a sequence, and its relation to a visual sequence.

In the auditory perceptual tests, therefore, it seemed that two patterns emerged:

i) all the subjects had relatively strong auditory discrimination and auditory blending ability at this point and weak auditory memory ability;

ii) all the subjects lacked the ability to coordinate several tasks which had to be performed simultaneously or in quick sequence.

Question 2: Are there patterns of oral reading performance for individual subjects and for the group as a whole that emerge from an analysis of their oral reading miscues?

When the oral reading miscues of individual subjects were examined in relation to the processing of grapho-phonemic, syntactic and semantic information it was found that all subjects were strongest in the processing of syntactic information as they read.

The group as a whole showed an increased ability to integrate graphic and phonemic information as the

study progressed,although their knowledge of graphic and phonemic relationships as measured by the graphic and phonemic proximity of the miscues and the stimuli, did not improve.

For all subjects, semantic processing was weaker than syntactic processing, although all the children were aware of the semantic component while they were reading.

All the subjects had difficulty integrating information from the different cue systems operating in the reading process viz., they had difficulty integrating information from the syntactic system with that from the semantic and grapho-phonic systems.

In the analysis of oral reading miscues, therefore, the following patterns emerged:

i) all the subjects were strongest in their ability to process syntactic information and the difference between their ability to use this system and the semantic and grapho-phonic systems was marked;

ii) all the subjects lacked the ability to use their strength in syntactic processing to good advantage while reading. They were unable to integrate efficiently information from the syntactic system with that from the grapho-phonic and semantic systems.

Question 3: Is there a relationship between the group auditory perceptual patterns revealed and their difficulties in reading as shown by

analysis of their oral reading miscues?

It was not found possible to make a quantitative comparison of patterns of performance in the two areas examined in this study. Nevertheless,the particular types of difficulties these boys showed while reading are the ones most affected by short term auditory memory, namely the efficient processing of grapho-phonic information and the processing of semantic information. There, a strong inference can be drawn that there is a relationship between their auditory perceptual patterns and their particular difficulties in reading. Further research would be necessary before firm conclusions can be drawn.

Question 4: Are the patterns of oral reading performance revealed in an analysis of their oral reading miscues stable over a period of time?

There were fluctuations from month to month in the ability of the group to process information from the different cue systems. During the period of the study the group as a whole showed increased efficiency only in the ability to integrate graphic and phonemic information. This was the area of major concentration in the teaching program during the months when this study took place.

Although they were very efficient in processing syntactic information from the beginning of the study, their ability to relate syntactic information to the information from all the other cue systems was not marked

and it became less marked by the end of the study.

The subjects showed an awareness of the need to process semantic information from the beginning and throughout the study. However their ability to do this was never as strong as their ability to process syntactic information. Furthermore their ability to integrate semantic information with grapho-phonic information and syntactic information was not marked at the beginning of the study and had declined by the end of the study.

It was concluded therefore, that the patterns of oral reading performance revealed in an analysis of oral reading miscues were not stable over the four month period that this study took place.

Limitations of the Study

The conclusions of this study are governed by a number of limitations resulting from the research design, and the choice of instruments used to carry out the design.

1. The conclusions reached in this study are based on a group of ten children only. They cannot be generalized to other groups of dyslexic children of different chronological ages and scholastic backgrounds.

2. The intervals between the collection of oral reading data and the overall time span of the study may have been too short to determine whether trends discerned were becoming established patterns of reading behaviour in this group of dyslexic children.

3. Norms were not available for several of the tests used to measure auditory perceptual abilities.

4. Very limited statistical treatment was given to the data; therefore, in most instances quantitative comparisons were difficult to make.

5. Only selected categories from K. Goodman's taxonomy (1969) were used in the analysis of oral reading miscues. Therefore, the information obtained from the analysis was not as intensive as it would have been had all categories of the taxonomy been used.

6. The level of commercial readers used in this study in order to accommodate the reading level of these subjects were designed for children of a younger chronological age. Therefore, the stories were not necessarily at the interest level of the subjects in the study and this could have affected the reading performance of these subjects.

7. Because of the limitations of the time demands that the writer could make on the school and classroom, subjects were asked to read three stories at the most during a session.

Implications of the Study

1. Since these dyslexic boys were extremely weak in short term auditory memory and strong in auditory discrimination and auditory blending, the implication could be drawn that a certain level of functioning of short term memory is necessary for success in learning to read.

These subjects may be failing to learn to read to their apparent capacity because of an inadequate level of short term memory development.

2. In the auditory perceptual tasks these subjects were particularly poor in auditory memory and discrimination tasks that required them to hold a sequence in mind while performing an operation. In their oral reading, it became apparent that they had difficulty in integrating information from different cue systems particularly when longer units were involved. The implication could be drawn that a major difficulty in coordinating different tasks is the basis for their weakness in both auditory perception and oral reading.

3. A further implication could be drawn that the difficulty in establishing the sound/symbol relationship in reading is only one facet of the problems these dyslexic boys encounter while learning to read, and not necessarily the most serious problem.

4. A majority of the subjects were poor in auditory discrimination early in their school career, but had shown improvement in this ability by the time this study took place. The implication can be made that these boys experienced a developmental lag in the auditory discrimination abilities necessary for reading progress, and that auditory discrimination is amenable to improvement both through maturation and through teaching.

5. Very small amounts of change were seen in the reading performance of these dyslexic boys during the four months of this study. During this time they were being taught in a class group smaller than the normal school class. The implication could be drawn that progress made by these children in reading will be slow and that organizational plans designed to help them will have to be long term ones.

6. Considerable variability in performance was seen from month to month in the reading of these subjects. The implication could be drawn that this variability is itself a characteristic of dyslexic boys.

7. These boys were particularly strong in the processing of syntactic information. The implication could be drawn that this reflects, in these boys, a basic linquistic competence, particularly in the automatic aspects of language, that develops somewhat independently of the level of development of auditory memory or other components of language such as the semantic component. The implication could also be drawn that this is the aspect of language development that is least dependent on adequate short term memory.

Recommendations for Teaching

1. Teaching these dyslexic boys must be designed specifically to make them more aware of the different cue

systems operating in the reading process and how they could be used in helping them to read successfully. It cannot be assumed that as these boys become more proficient at using the graphic and phonemic cue systems they will automatically become more proficient at integrating the others.

2. Teaching of these dyslexic boys should be "diagnostic teaching" and proceed on a full understanding of their strengths and weaknesses. It should be designed to take advantage of their strengths and build up their weakness. Constant evaluation of their performance should take place since changes in patterns of performance occur.

3. While the taxonomy used in this study is too cumbersome an instrument for use by a classroom teacher, the concepts on which it is based are useful tools for diagnostic teaching. Much could be learned about these children's reading through an examination of their oral reading miscues. They should be reminded constantly to monitor themselves and to develop correcting strategies independently. They should be taught that regressions for correction are acceptable and desirable; and they need to be taught directly the different strategies they could use to help them when they make a miscue in reading.

4. Since these children are particularly strong at

processing syntactic information, a teaching approach that uses sentence patterns with which they are familiar could be useful--provided they are taught specifically to think of the clues that are available in the sentence structure, and to relate them to the other information they have. Their own stories would be good tools for using this approach.

5. Since their auditory memory is weak, these students will need more teaching and review than children of the same age and intelligence to ensure adequate learning. They should be helped to develop aids to memory through meaningful associations, and through the use of other channels, e.g., the motor, visual and kinaesthetic.

6. Teaching in the past has taken cognizance of the need to develop auditory discrimination and auditory blending ability in beginning readers. The same attention now needs to be paid to the development of methods to improve auditory memory--and particularly to the improvement of the ability to coordinate several tasks at the same time.

7. The difficulty level of materials used with these subjects is not best judged by the number of errors made while reading. Factors such as the length and complexity of sentences should be considered.

Recommendations for Further Research

1. Inadequate auditory memory and poor reading skills

are related. Since reading and writing follow on speaking and listening and since adequate speaking and listening are dependent on an adequate store of concepts and vocabulary, there is need for basic research on

a) the effects of auditory memory on speech and concept development, particularly in the preschool years;

b) the level of conceptual development and oral vocabulary of dyslexics at different ages.

2. These subjects are weak in short term auditory memory and poorest in processing semantic information while reading. There is need for further research on

a) the specific relationship between short term memory span and the ability to hold a sequence of words in mind to arrive at the meaning of sentences of different complexity;

b) the specific relationship between short term auditory memory span and the ability to hold a sequence of ideas in mind as part of the process of gaining the total meaning of passages of different length.

3. These subjects are weak in processing semantic information while reading and strong in the processing of syntactic information. There is need for basic research on the specific relationship between syntactic and semantic processing in reading and the particular

nature of each.

4. There is need for longitudinal research to determine whether, and under what circumstances, short term auditory memory of dyslexics can be improved; and whether any improvement would be accompanied by improvement in their reading performance.

5. Little research has been done on the developmental patterns of dyslexics. This study was done over a four month period with a group fo dyslexics between the ages of eight and ten. There is need for future research over longer periods of time with dyslexics of different age levels to study changes which occur both as a result of maturation and as a result of the application of different teaching techniques.

6. A few batteries of tests have been developed for the early identification of "high risk" children of whom dyslexics form a part. In the main, they are lengthy and more suitable for clinical use by specialists. There is need for the development of tests that will identify high risk children, that can be administered as screening devices to large groups of children by teachers.

7. Tests of auditory discrimination and auditory memory considered in addition to the regular readiness tests may add considerably the predictive nature of these tests. However, few tests of different facets of auditory memory

are available with normative data. There is need for the development of such testing instruments.

8. There is an urgent need for the development of teaching materials suitable for the use of older dyslexic children such as those in this study. These materials would have to be carefully designed to take account of their interest level, their particular difficulties, and the need to help them integrate the different cue systems while reading.

9. In this study it was found that the greatest amount of disagreement between the rater and the researcher in the use of taxonomy was found in the categories on graphic and phonemic proximity. There is need for further clarification of the points on the scale to ensure greater accuracy in the use of the instrument by different researchers.

Concluding Statement

Although there was considerable variability from subject to subject in this group, in their performance on auditory perceptual tests a general pattern of performance for the group as a whole did emerge. Similarly, although there was considerable variability within subjects and between subjects in their patterns of oral reading performance from month to month, general patterns of performance, indicating the areas of their difficulty in reading did emerge. This information could be used in further devel-

ment of programs for these children.

There is a need now to develop precise methods for early identification of dyslexic children; and for the development of precise methods to help the dyslexic children to develop their auditory memory and to integrate information from the language cues while reading.

APPENDIX A

GOODMAN'S TAXONOMY OF CUES AND MISCUES IN READING (As Used in This Study)

The following code was used in the Analysis of Miscues:

1. Miscues Per hundred Words

2. Miscues Corrected

   1 - miscues successfully corrected

   9 - unsuccessful attempt at correction

   2 - correct response abandoned

   0 - no attempt made to correct the miscue

3. Word--Phrase Identification

   1 - Never

   2 - Correct earlier

   3 - Very Next Encounter

   4 - Second Encounter

   5 - Third + Encounter

   6 - Inconsistent

   7 - Never Recurs

4. Observed Response in Periphery

   1 - Near Field

   2 - Extended Field

5. Habitual Association

Two or more occurrences of the same substitution for a printed stimulus.

6. Graphic Proximity

Examples representative of points on the scale:

0 - no similarity

1 - zoom/cook

2 - helped/moved

3 - perceive/perhaps

4 - went/wanted

5 - pets/puppies

6 - when/then

7 - felt/left; was/saw

8 - batter/butter

9 - read/read

7. Phonemic Proximity

Examples representative of points on the scale:

0 - no similarity

1 - saw/was

2 - kite/cap

3 - pets/puppies

4 - quietly/quickly

5 - unusual/usually

6 - Miss/Mrs.

7 - grow/grew

8 - went/wint

9 - two/too

8. Grammatical Function of Stimulus and Response

Words and phrases are coded as follows:

1 - Noun

2 - Verb

3 - Adjective

4 - Adverb

5 - Function Word

6 - Indeterminate

9. Levels of Language

1. Submorphemic Level:

   a - Substitution

   b - Insertion

   c - Omission

   d - Reversal

2. Bound Morpheme Level:

   a - Substitution

   b - Insertion

   c - Omission

   d - Reversal

3. Word Level:

   a - Substitution

   b - Insertion

   c - Omission

   d - Reversal

4. Phrase Level:

   a - Substitution

   b - Insertion

   c - Omission

   d - Reversal

5. Sentence Level:

   a - Substitution

   b - Insertion

   c - Omission

   d - Reversal

10. Syntactic Proximity

Points on the scale coded as follows:

0 - unrelated

1 - little in common

2 - key element in common

3 - major change in syntax

4 - change in phrase structure

5 - syntactic change within phrase structure

6 - change in person, tense or number of the response

7 - change in choice of function word

8 - syntax unchanged

11. Semantic Proximity

Points on the scale coded as follows:

0 - unrelated

1 - vaguely related

2 - meaning appropriate but unrelated to stimulus

3 - meaning of the response semantically associated with either prior or subsequent portions of text

4 - some association between meaning of the stimulus and response

5 - stimulus and response are antonyms

6 - response has an associated meaning with the stimulus

7 - response involves slight change in connotation or similar name substitution

8 - stimulus and response are synonyms

9 - no change in meaning between the stimulus and response

12. Syntactic Acceptability

1 - not acceptable

2 - acceptable with prior portion

3 - acceptable with subsequent portion

4 - acceptable in sentence, but not passage

5 - acceptable in total passage

13. Semantic Acceptability

1 - not acceptable

2 - acceptable with prior portion of sentence

3 - acceptable with subsequent portion of sentence

4 - acceptable in sentence, but not passage

5 - acceptable in total passage

APPENDIX B

Figures 2 - 21

FIGURE 2 -- SUBJECT A

PERCENTAGE OF ERRORS ON AUDITORY PERCEPTUAL TESTS

1. Wepman - 1st testing
2. Wepman - last testing
3. Fast-Cosens
4. Monroe-Sherman--Orientation and Discrimination
5. Roswell-Chall--Auditory Blending
6. Monroe-Sherman Letter Memory
7. Rogers - Letters Forward
8. - Letters Backward
9. - Digits Forward
10. - Digits Backward
11. Detroit - Unrelated Words

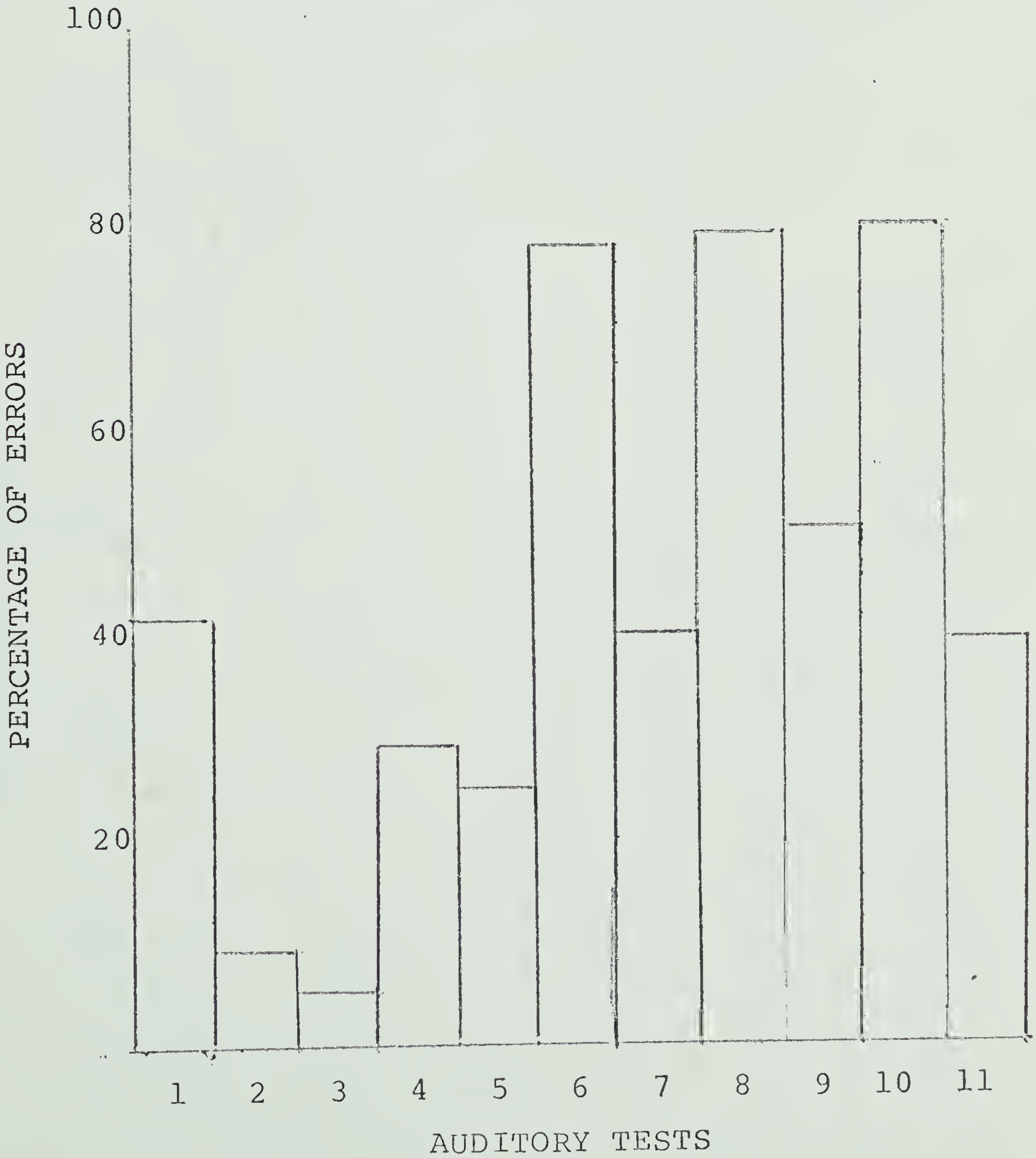


FIGURE 3 -- SUBJECT B

PERCENTAGE OF ERRORS ON AUDITORY PERCEPTUAL TESTS

1. Wepman - 1st testing
2. Wepman - last testing
3. Fast-Cosens
4. Monroe-Sherman--Orientation and Discrimination
5. Roswell-Chall--Auditory Blending
6. Monroe-Sherman Letter Memory
7. Rogers - Letters Forward
8. - Letters Backward
9. - Digits Forward
10. - Digits Backward
11. Detroit - Unrelated Words

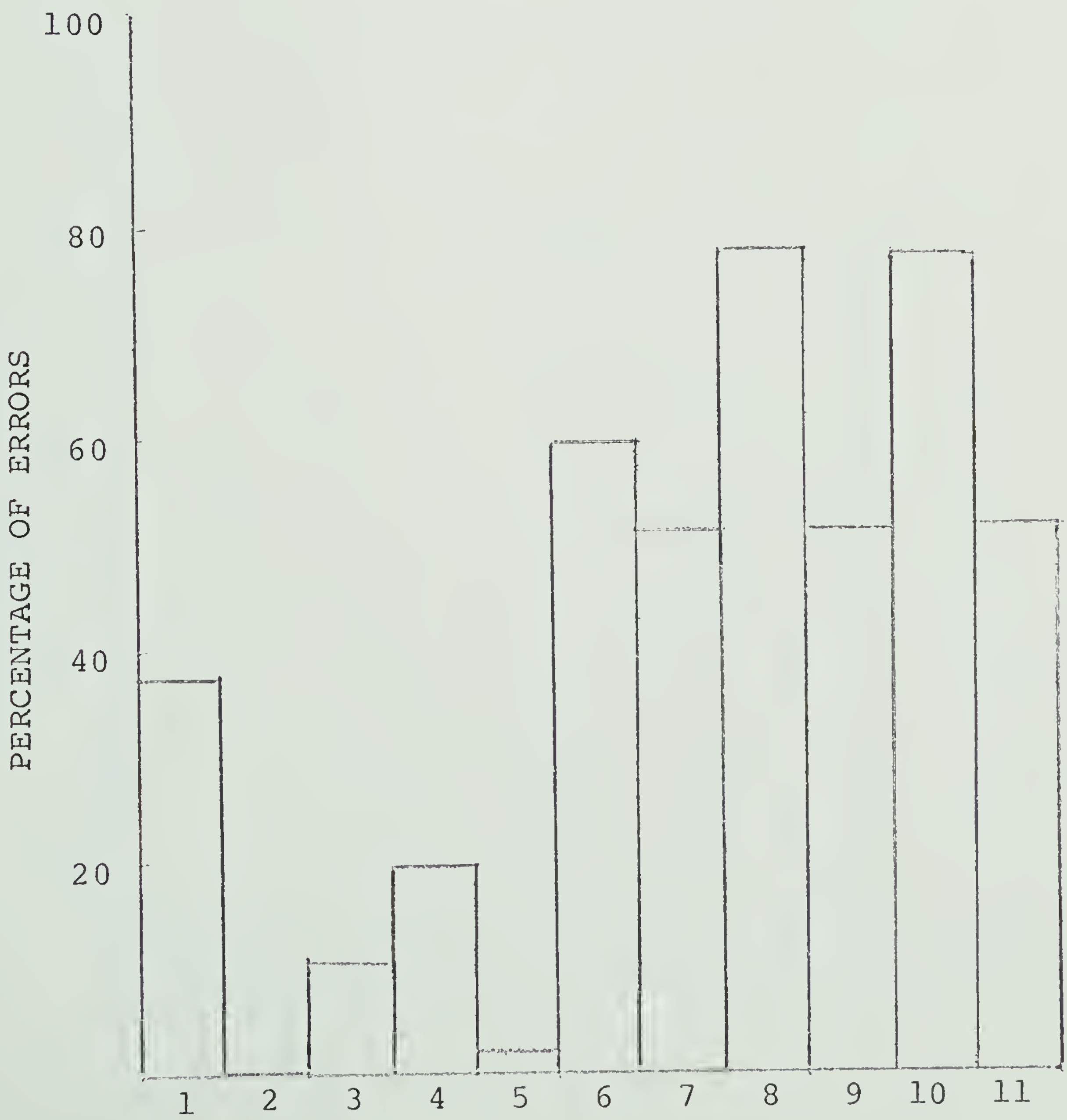


FIGURE 4--SUBJECT C

PERCENTAGE OF ERRORS ON AUDITORY PERCEPTUAL TESTS

1. Wepman - 1st testing
2. Wepman - last testing
3. Fast-Cosens
4. Monroe-Sherman--Orientation and Discrimination
5. Roswell-Chall--Auditory Blending
6. Monroe-Sherman--Leter Memory
7. Rogers - Letters Forward
8. - Letters Backward
9. - Digits Forward
10. - Digits Backward
11. Detroit - Unrelated Words

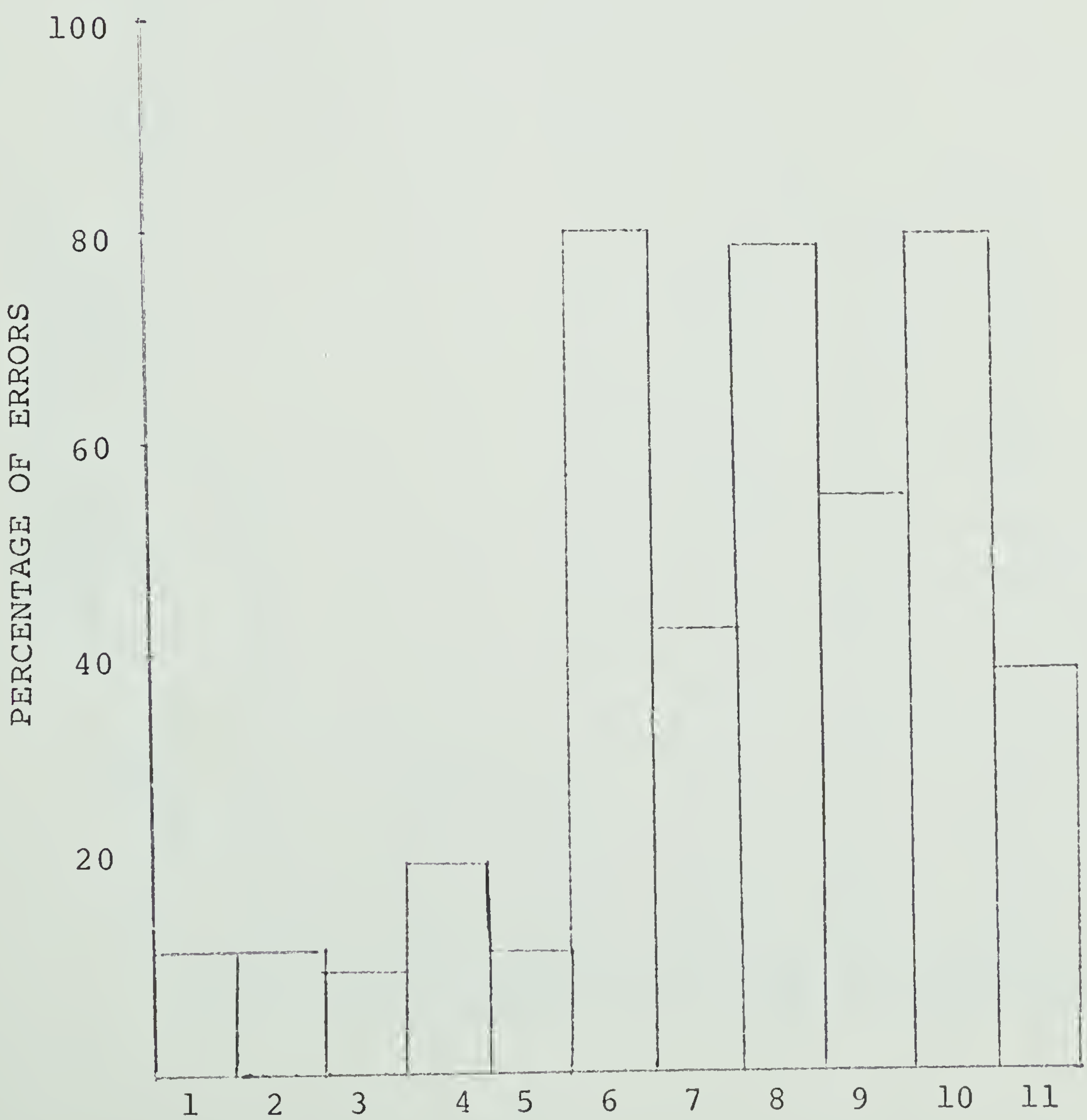


FIGURE 5--SUBJECT D

PERCENTAGE OR ERRORS ON AUDITORY PERCEPTUAL TESTS

1. Wepman - 1st testing
2. Wepman - last testing
3. Fast-Cosens
4. Monroe-Sherman--Orientation and Discrimination
5. Roswell-Chall-- Auditory Blending
6. Monroe-Sherman Letter Memory
7. Rogers - Letters Forward
8. - Letters Backward
9. - Digits Forward
10. - Digits Backward
11. Detroit--Unrelated Words

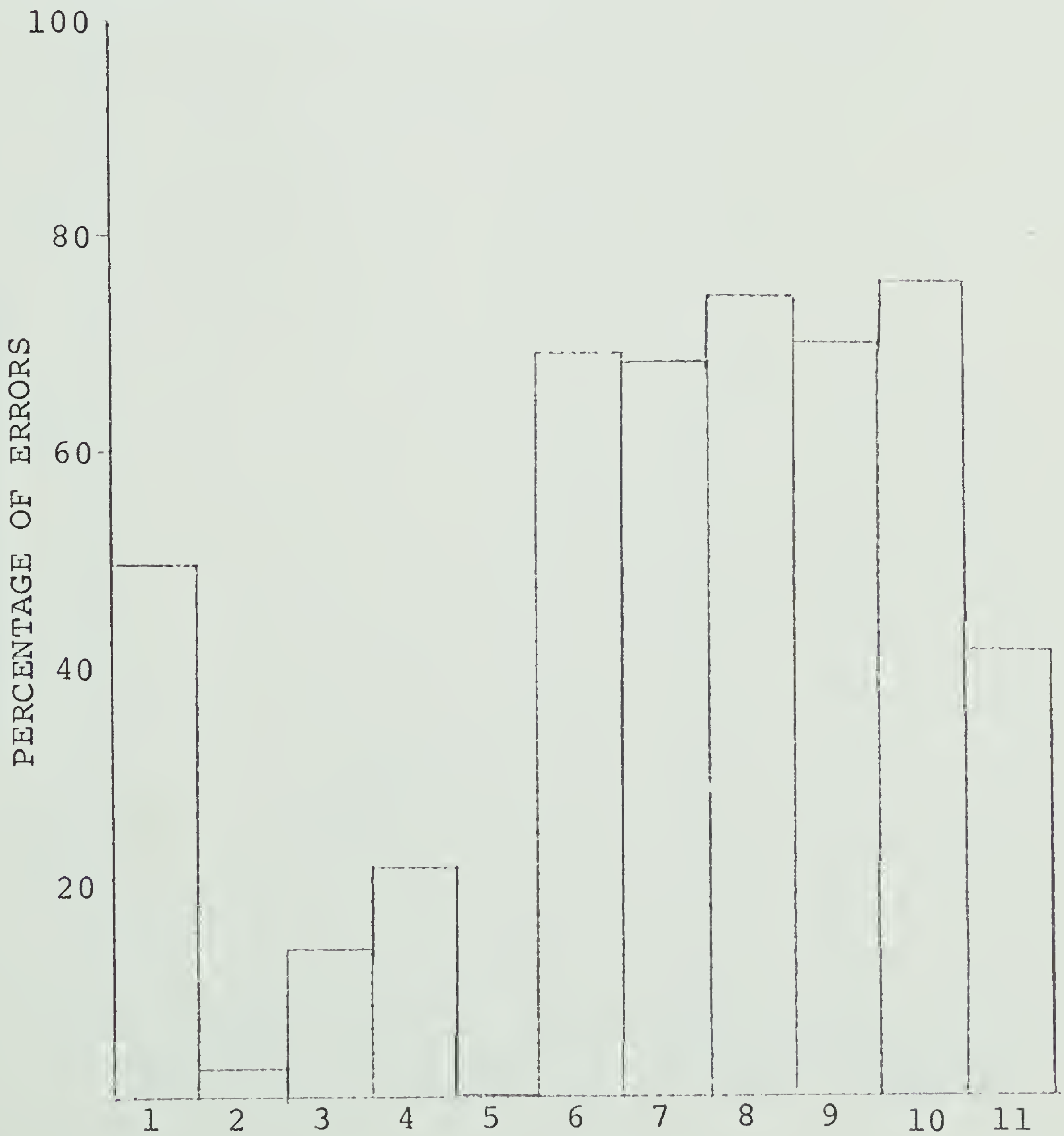


FIGURE 6--SUBJECT E

PERCENTAGE OF ERRORS ON AUDITORY PERCEPTUAL TESTS

1. Wepman - 1st testing
2. Wepman - last testing
3. Fast-Cosens
4. Monroe-Sherman--Orientation and Discrimination
5. Roswell-Chall--Auditory Blending
6. Monroe-Sherman--Leter Memory
7. Rogers - Letters Forward
8. - Letters Backward
9. - Digits Forward
10. - Digits Backward
11. Detroit--Unrelated Words

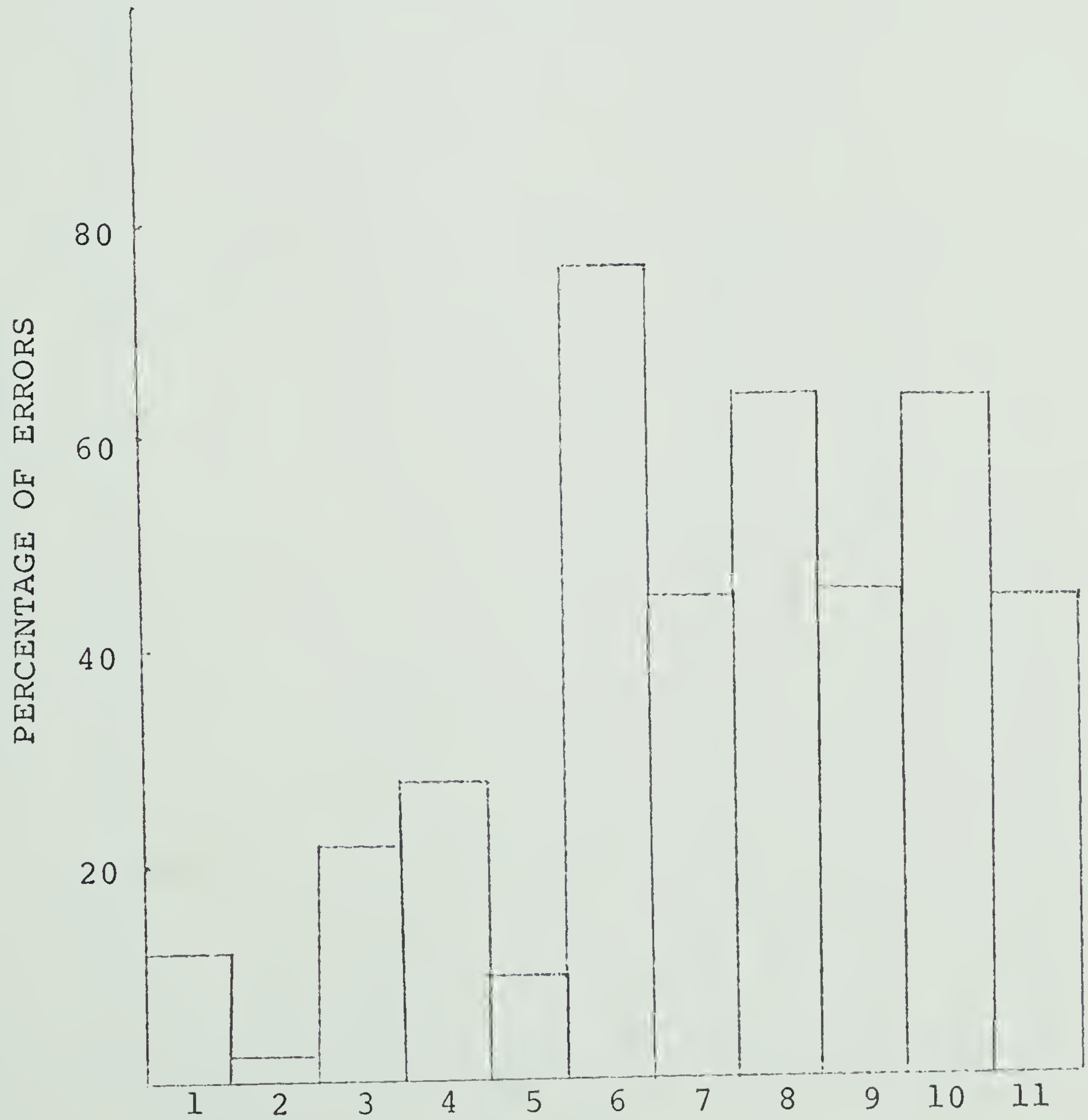


FIGURE 7--SUBJECT F

PERCENTAGE OF ERRORS ON AUDITORY PERCEPTUAL TESTS

1. Wepman - 1st testing
2. Wepman - last testing
3. Fast-Cosens
4. Monroe-Sherman--Orientation and Discrimination
5. Roswell-Chall--Auditory Blending
6. Monroe-Sherman--Letter Memory
7. Rogers - Letters Forward
8. - Letters Backward
9. - Digits Forward
10. - Digits Backward
11. Detroit--Unrelated Words

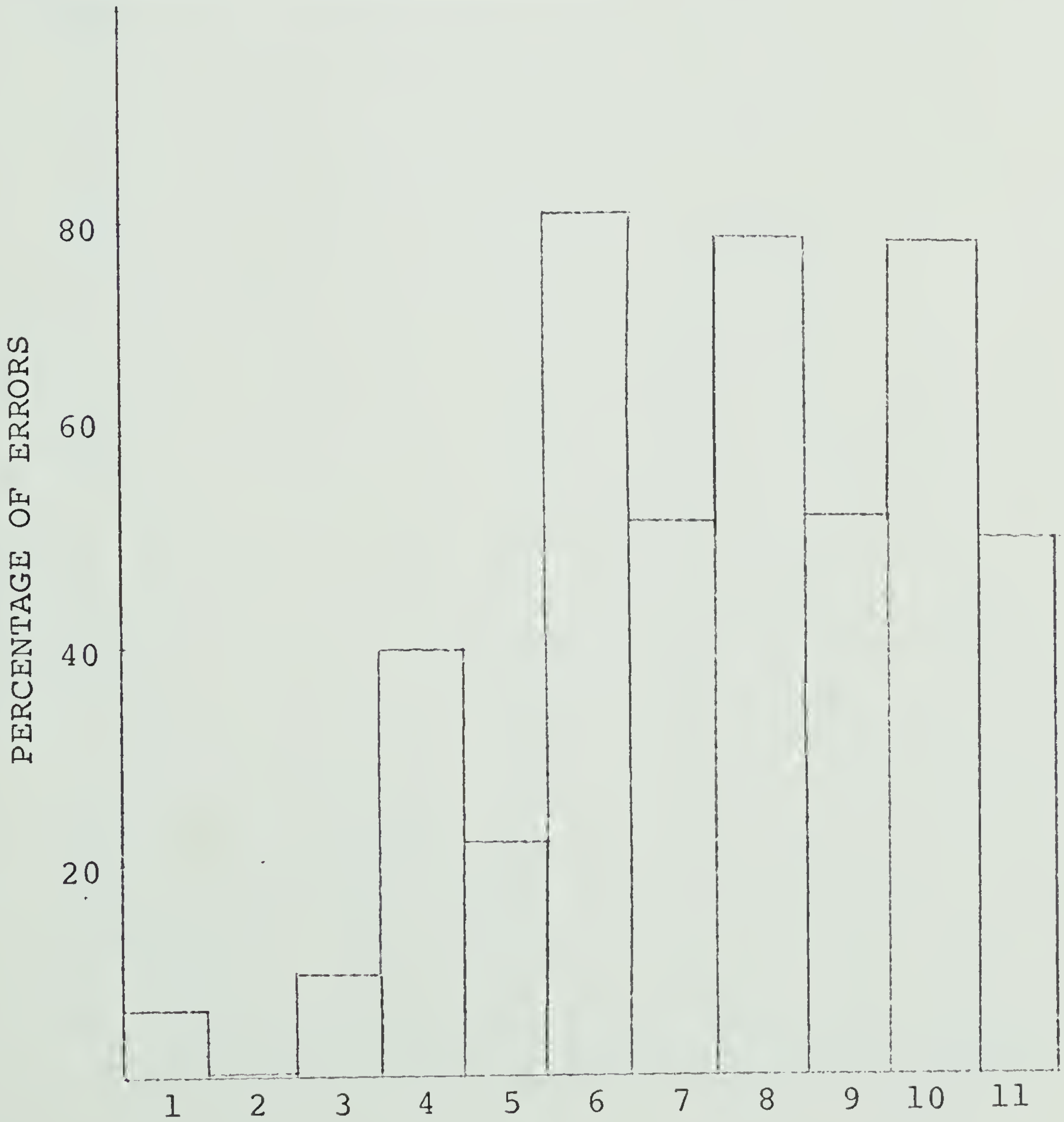


FIGURE 8--SUBJECT G

PERCENTAGE OF ERRORS ON AUDITORY PERCEPTUAL TESTS

1. Wepman - 1st testing
2. Wepman - last testing
3. Fast-Cosens
4. Monroe-Sherman--Orientation and Discrimination
5. Roswell-Chall--Auditory Blending
6. Monroe-Sherman Letter Memory
7. Rogers - Letters Forward
8. - Letters Backward
9. - Digits Forward
10. - Digits Backward
11. Detroit--Unrelated Words

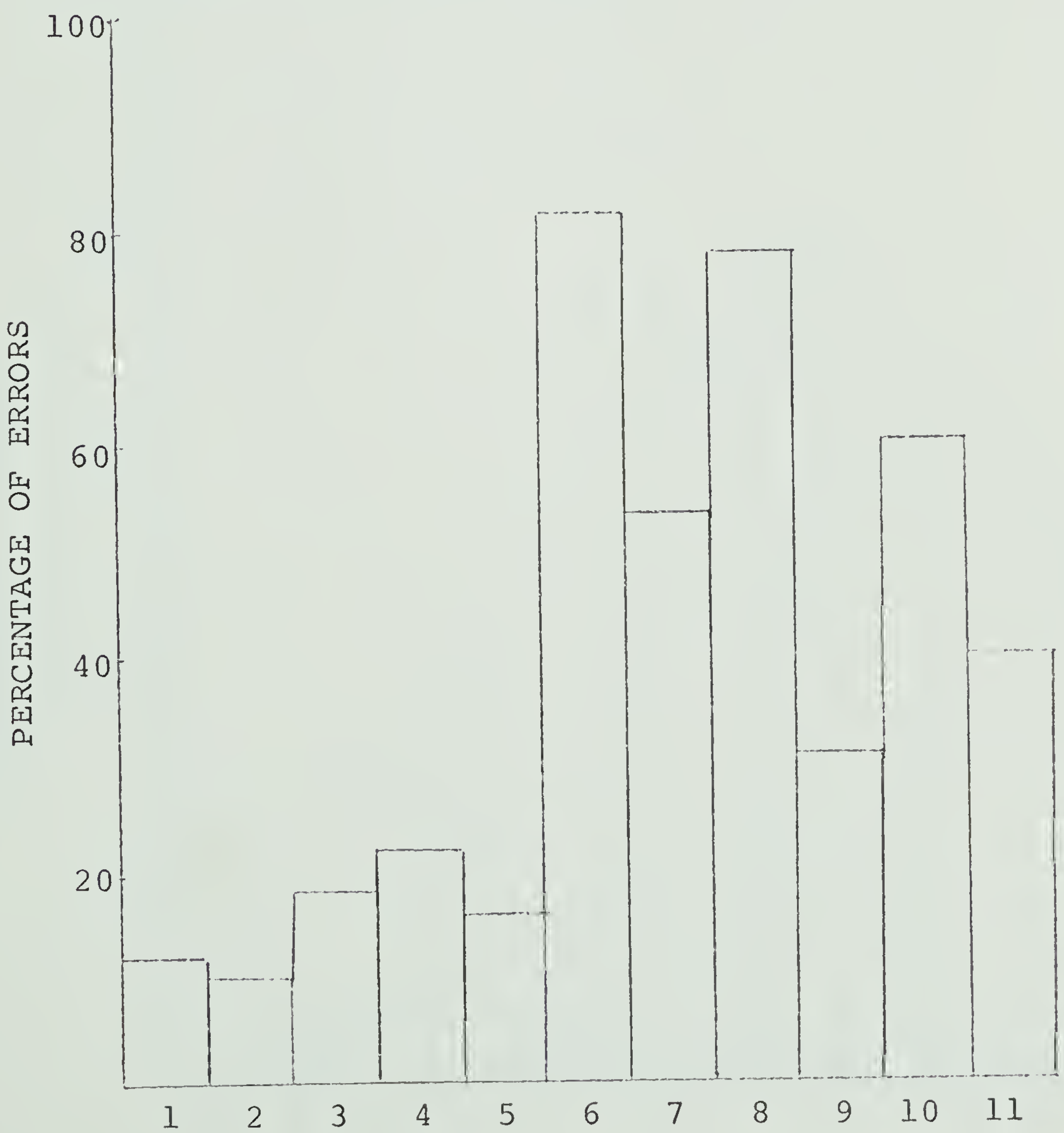


FIGURE 9--SUBJECT H

PERCENTAGE OF ERRORS ON AUDITORY PERCEPTUAL TESTS

1. Wepman - 1st reading
2. Wepman - last reading
3. Fast-Cosens
4. Monroe-Sherman--Orientation and Discrimination
5. Roswell-Chall--Auditory Blending
6. Monroe-Sherman Letter Memory
7. Rogers - Letters Forward
8. - Letters Backward
9. - Digits Forward
10. - Digits Backward
11. Detroit--Unrelated Words

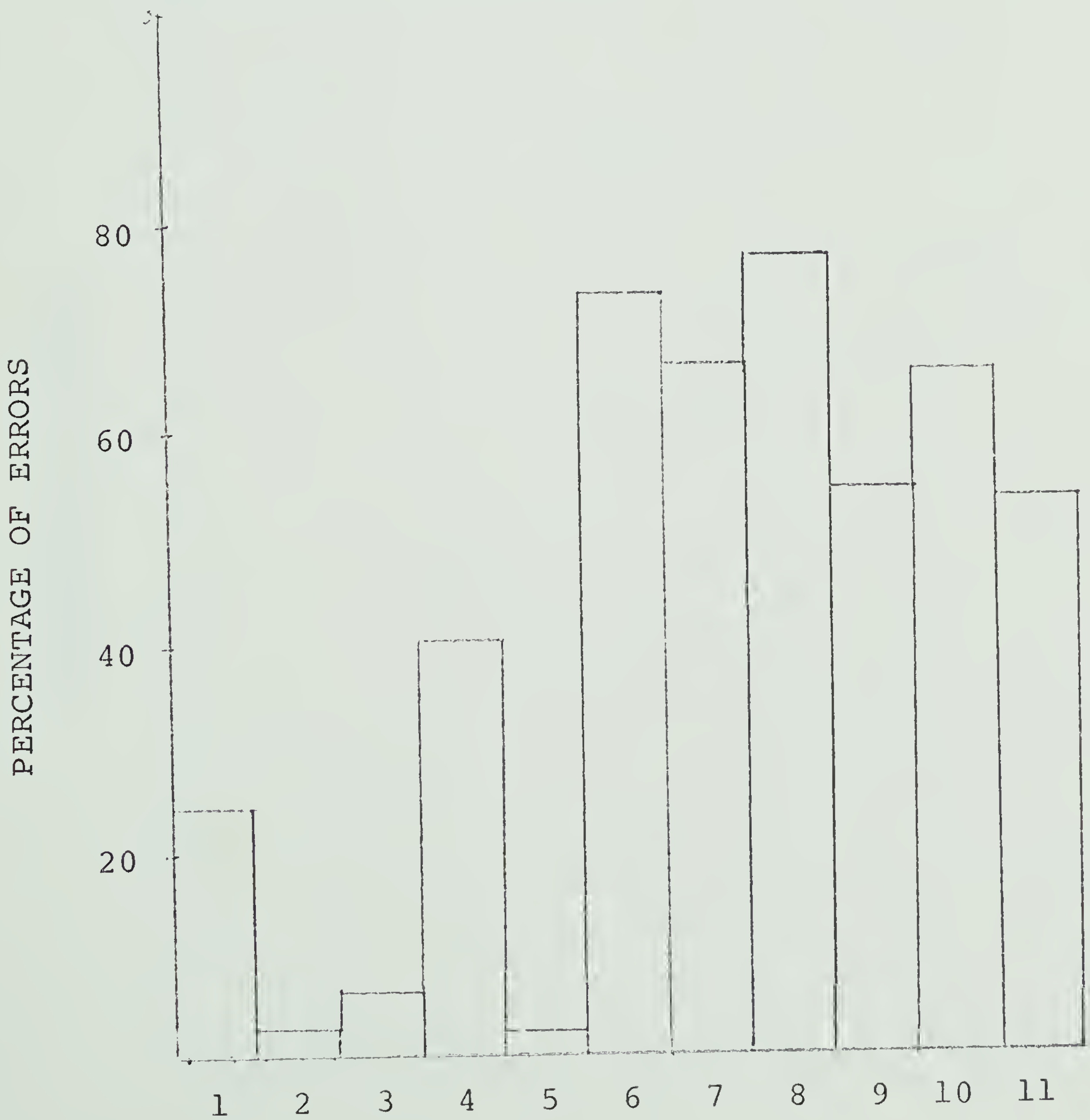


FIGURE 10--SUBJECT I

PERCENTAGE OF ERRORS ON AUDITORY PERCEPTUAL TESTS

1. Wepman - 1st testing
2. Wepman - last testing
3. Fast-Cosens
4. Monroe-Sherman--Orientation and Discrimination
5. Roswell-Chall--Auditory Blending
6. Monroe-Sherman Letter Memory
7. Rogers - Letters Forward
8. - Letters Backward
9. - Digits Forward
10. - Digits Backward
11. Detroit--Unrelated Words

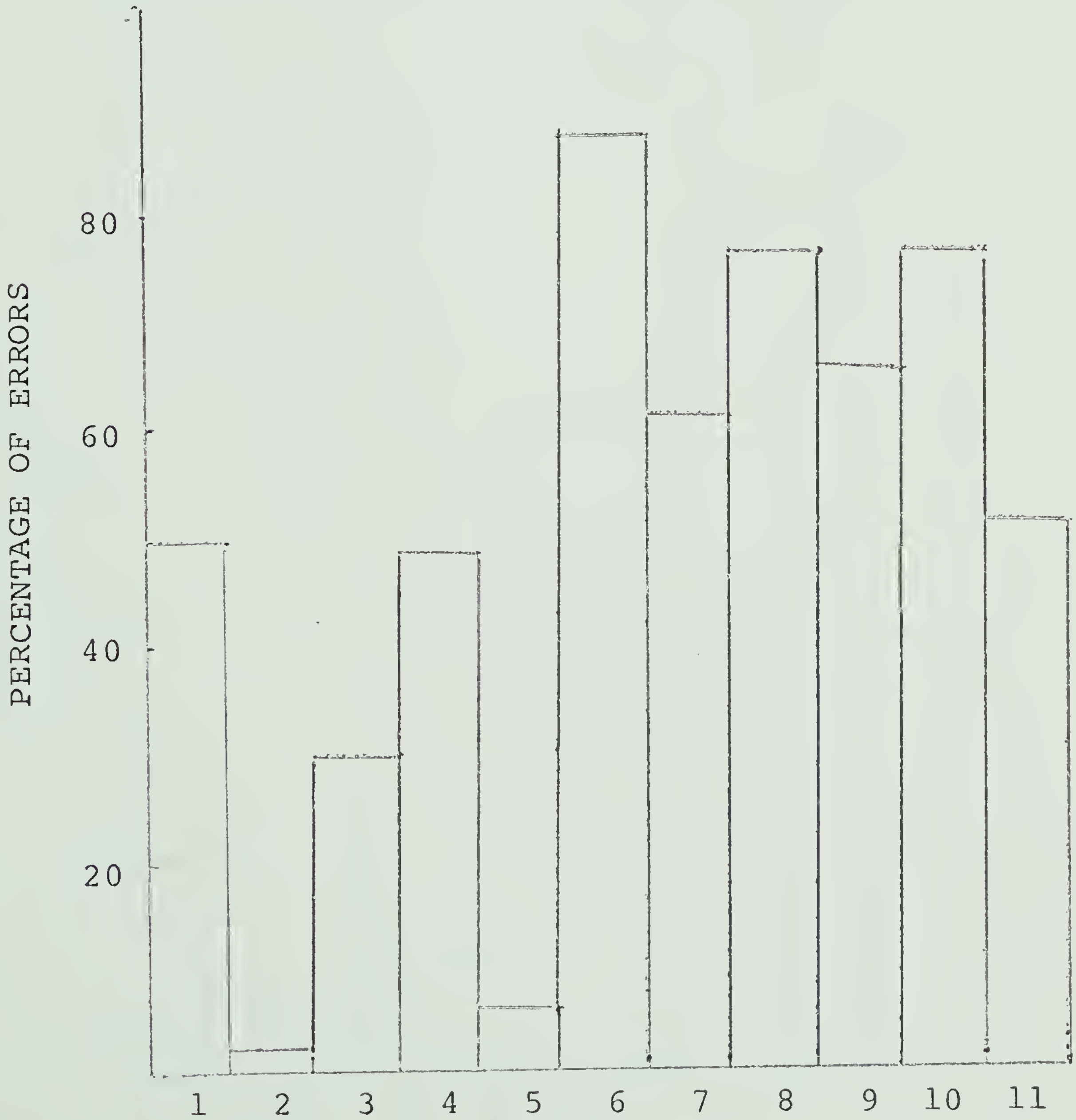


FIGURE 11--SUBJECT J

PERCENTAGE OF ERRORS ON AUDITORY PERCEPTUAL TESTS

1. Wepman - 1st testing
2. Wepman - last testing
3. Fast-Cosens
4. Monroe-Sherman--Orientation and Discrimination
5. Roswell-Chall--Auditory Blending
6. Monroe-Sherman Letter Memory
7. Rogers - Letters Forward
8. - Letters Backward
9. - Digits Forward
10. - Digits Backward
11. Detroit--Unrelated Words

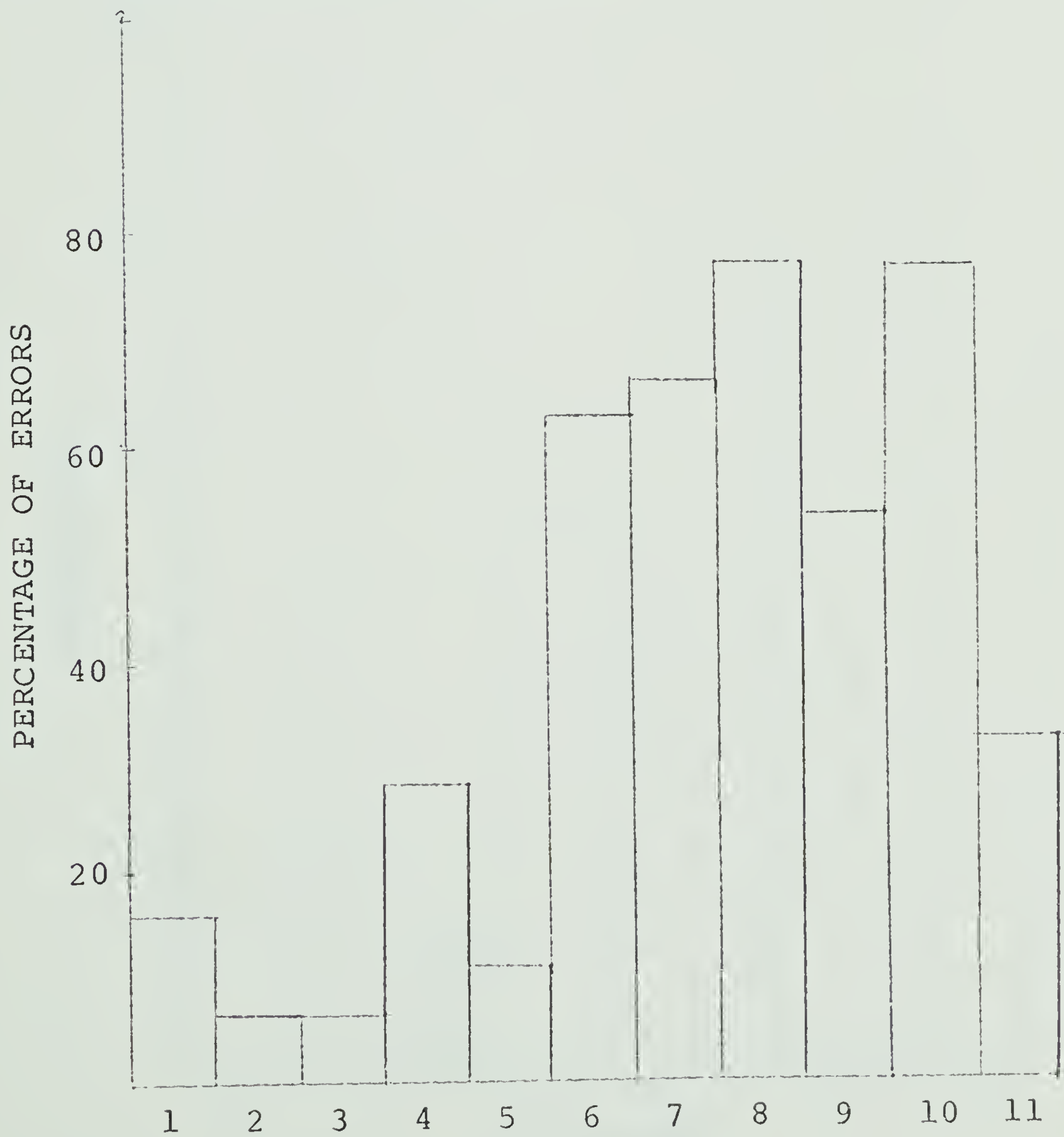


FIGURE 12--SUBJECT A

PATTERNS OF ORAL READING PERFORMANCE

1. Miscues per Hundred Words
2. Percentage Attempts at Correction
3. Percentage Miscues in Periphery
4. Habitual Associations
5. Graphic Proximity
6. Phonemic Proximity
7. Syntactic Proximity
8. Semantic Proximity
9. Syntactic Acceptability
10. Semantic Acceptability

KEY:

____ December

---- March

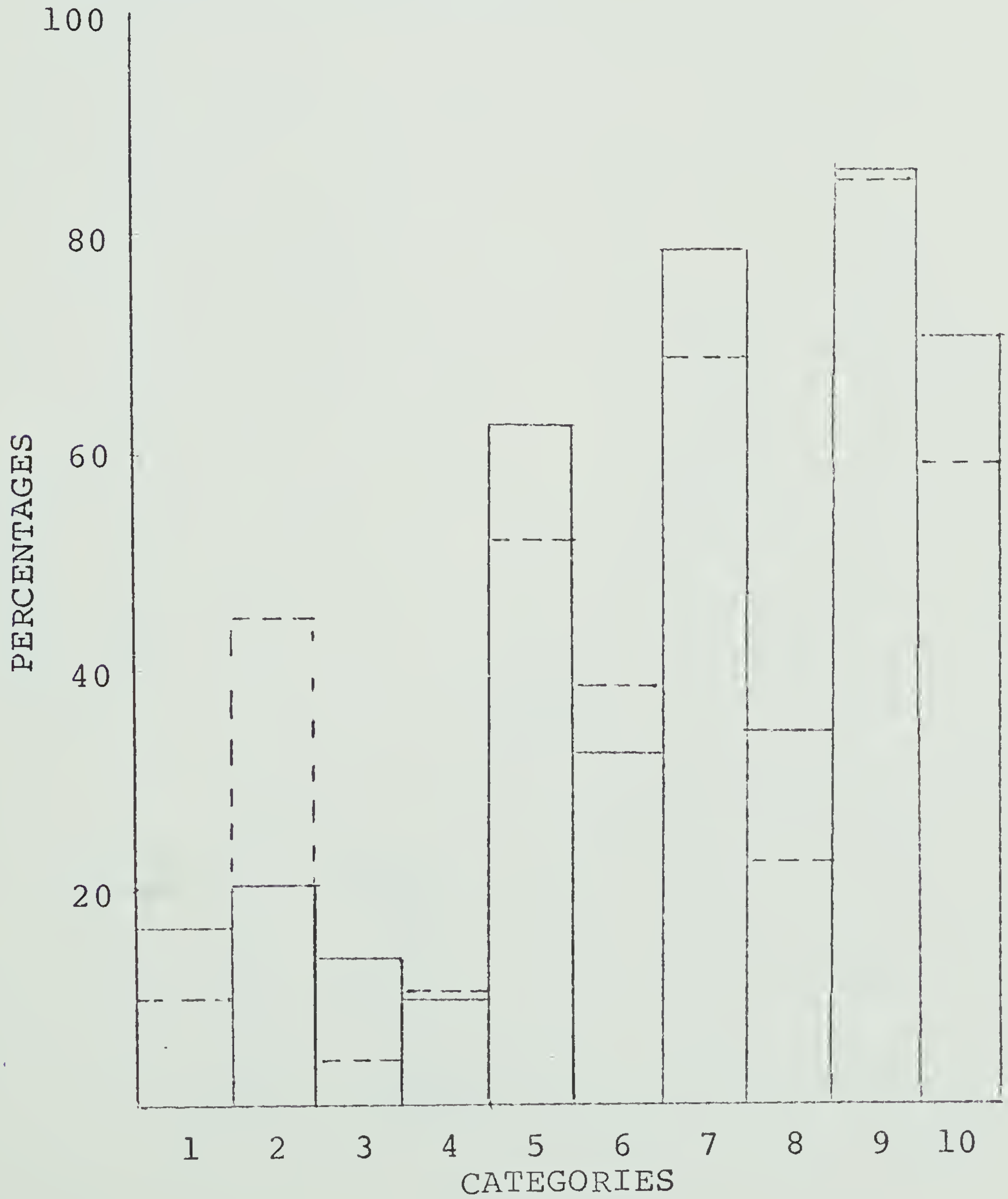


FIGURE 13--SUBJECT B

PATTERNS OF ORAL READING PERFORMANCE

1. Miscues per Hundred Words
2. Percentage Attempts at Correction
3. Percentage Miscues in Periphery
4. Habitual Associations
5. Graphic Proximity
6. Phonemic Proximity
7. Syntactic Proximity
8. Semantic Proximity
9. Syntactic Acceptability
10. Semantic Acceptability

KEY:
____ December
----- March

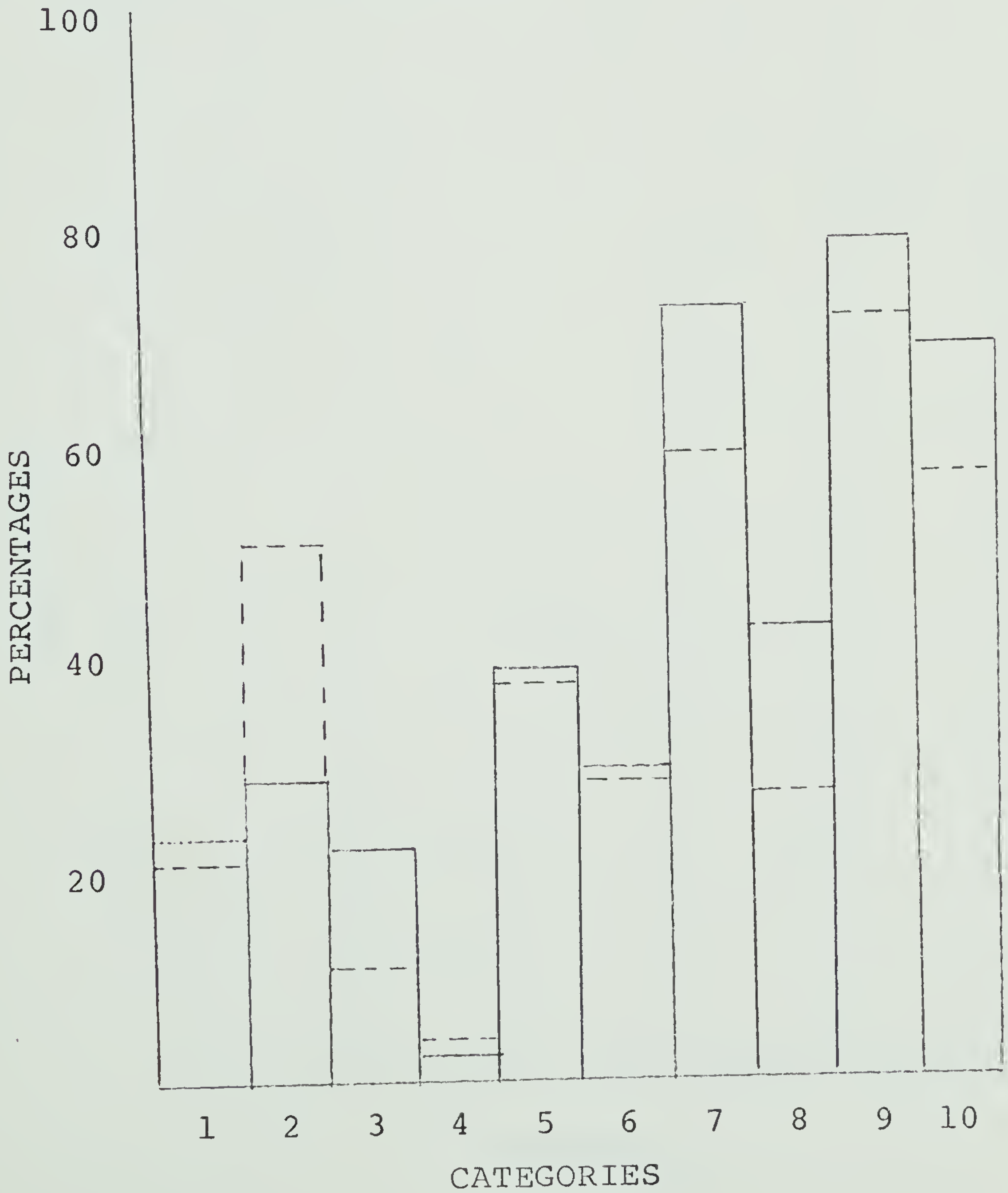


FIGURE 14--SUBJECT C

PATTERNS OF ORAL READING PERFORMANCE

1. Miscues per Hundred Words
2. Percentage Attempts at Correction
3. Percentage Miscues in Periphery
4. Habitual Associations
5. Graphic Proximity
6. Phonemic Proximity
7. Syntactic Proximity
8. Semantic Proximity
9. Syntactic Acceptability
10. Semantic Acceptability

KEY:

____ December

- - - - March

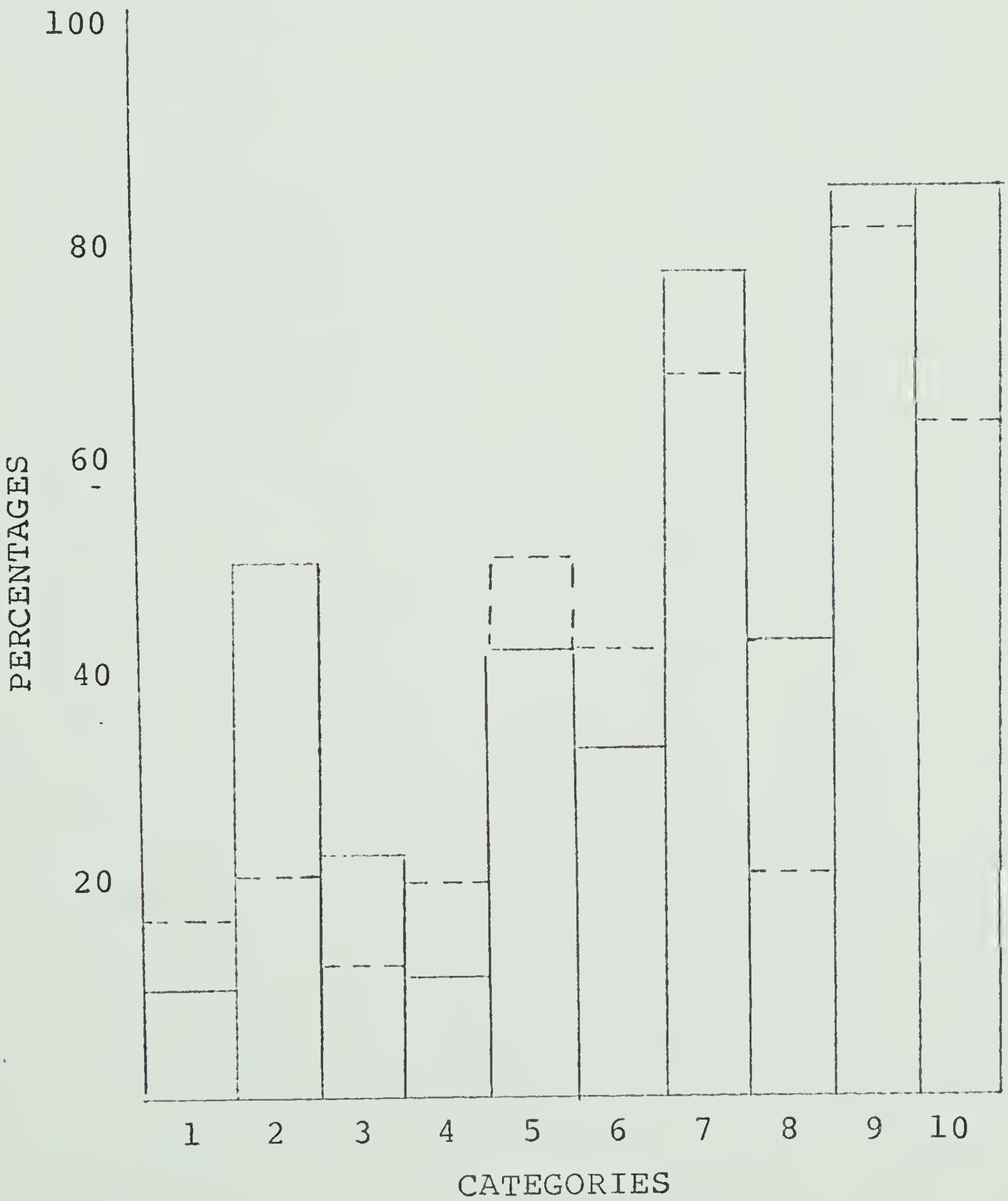


FIGURE 15--SUBJECT D

PATTERNS OF ORAL READING PERFORMANCE

1. Miscues per Hundred Words
2. Percentage Attempts at Correction
3. Percentage Miscues in Periphery
4. Habitual Associations
5. Graphic Proximity
6. Phonemic Proximity
7. Syntactic Proximity
8. Semantic Proximity
9. Syntactic Acceptability
10. Semantic Acceptability

KEY:

____ December

---- March

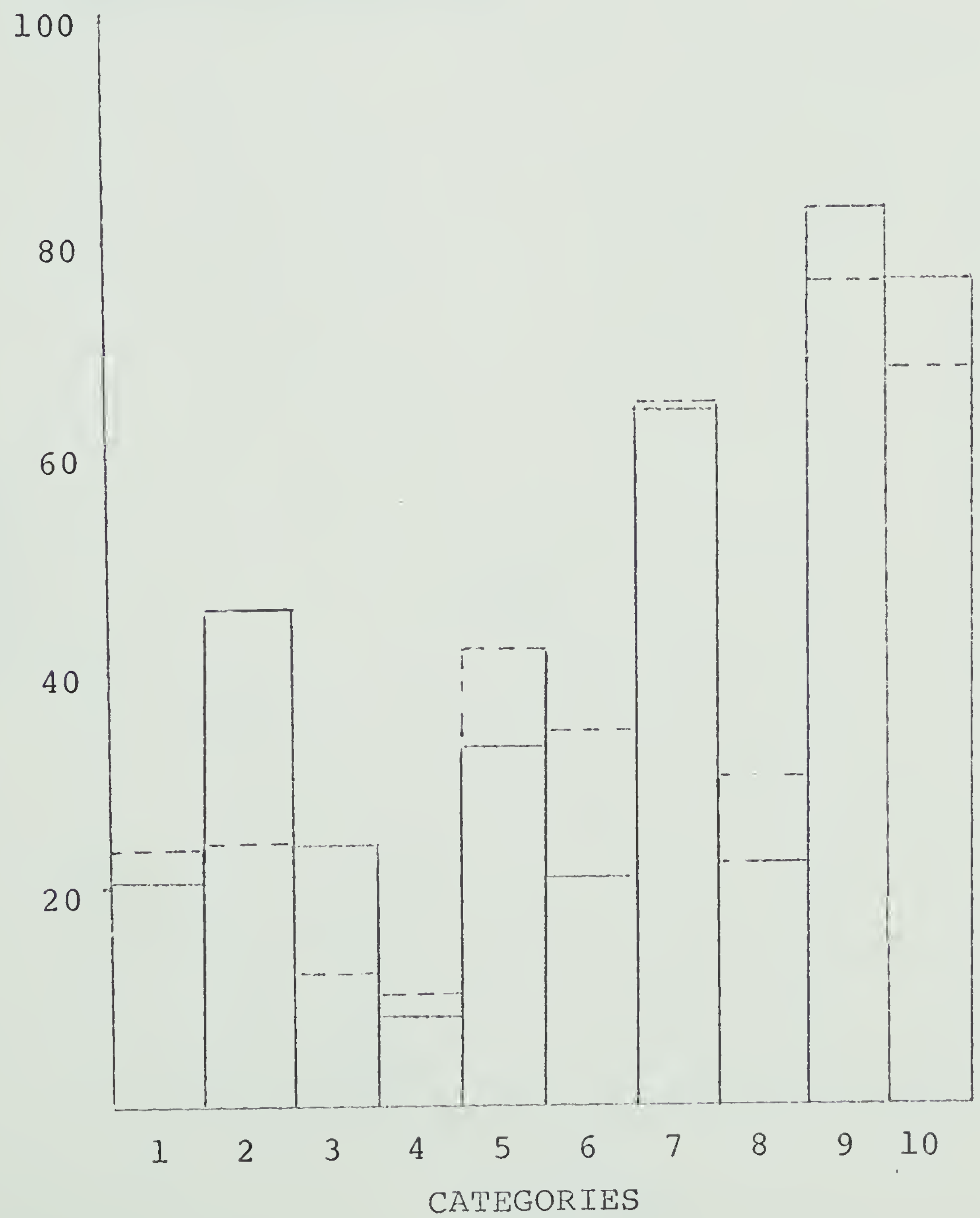


FIGURE 16--SUBJECT E

PATTERNS OF ORAL READING PERFORMANCE

1. Miscues per Hundred Words
2. Percentage Attempts at Correction
3. Percentage Miscues in Periphery
4. Habitual Associations
5. Graphic Proximity
6. Phonemic Proximity
7. Syntactic Proximity
8. Semantic Proximity
9. Syntactic Acceptability
10. Semantic Acceptability

KEY:

____ December

---- March

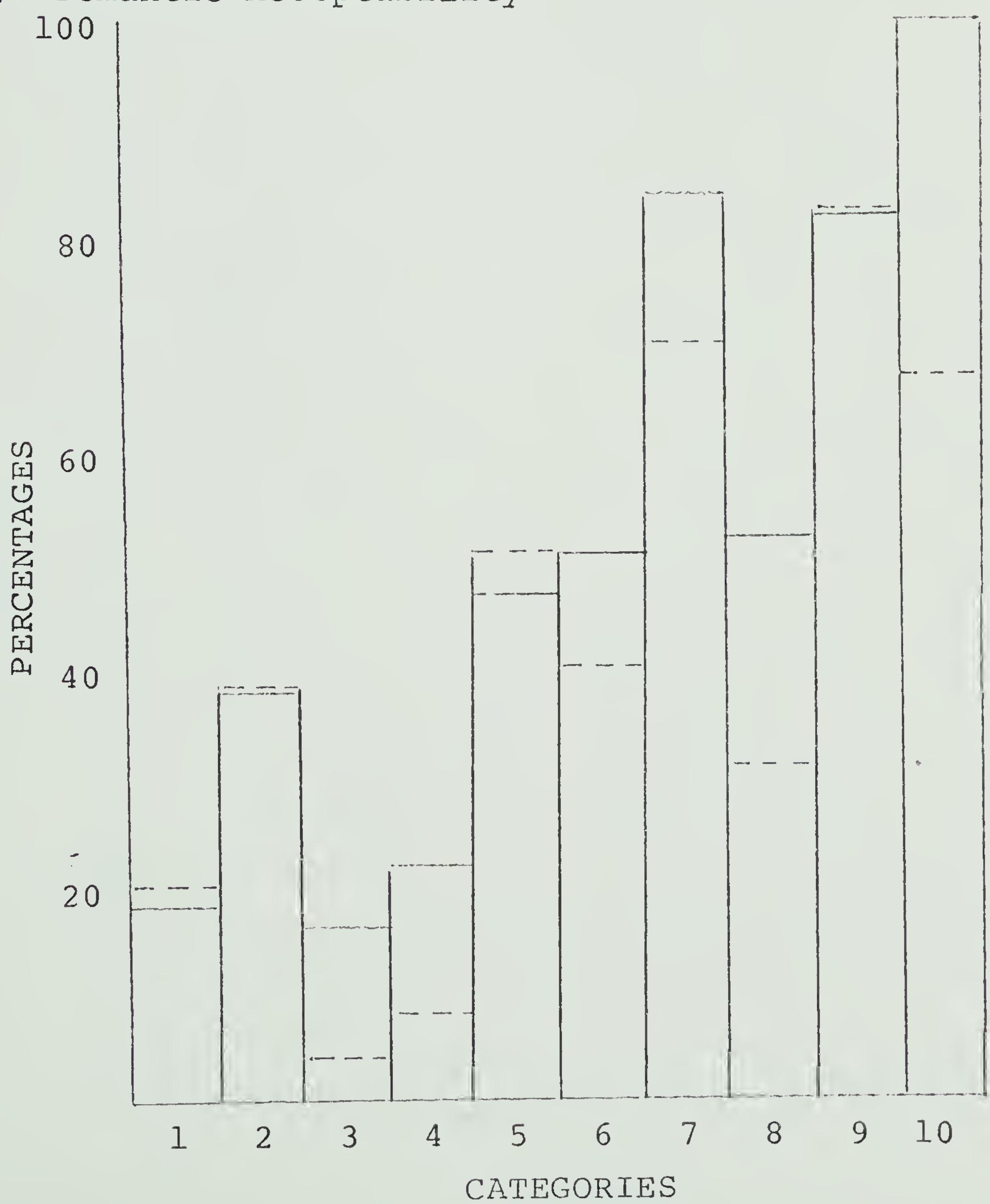


FIGURE 17--SUBJECT F

PATTERNS OF ORAL READING PERFORMANCE

1. Miscues per Hundred Words
2. Percentage Attempts at Correction
3. Percentage Miscues in Periphery
4. Habitual Associations
5. Graphic Proximity
6. Phonemic Proximity
7. Syntactic Proximity
8. Semantic Proximity
9. Syntactic Acceptability
10. Semantic Acceptability

KEY:

_____ December

---- March

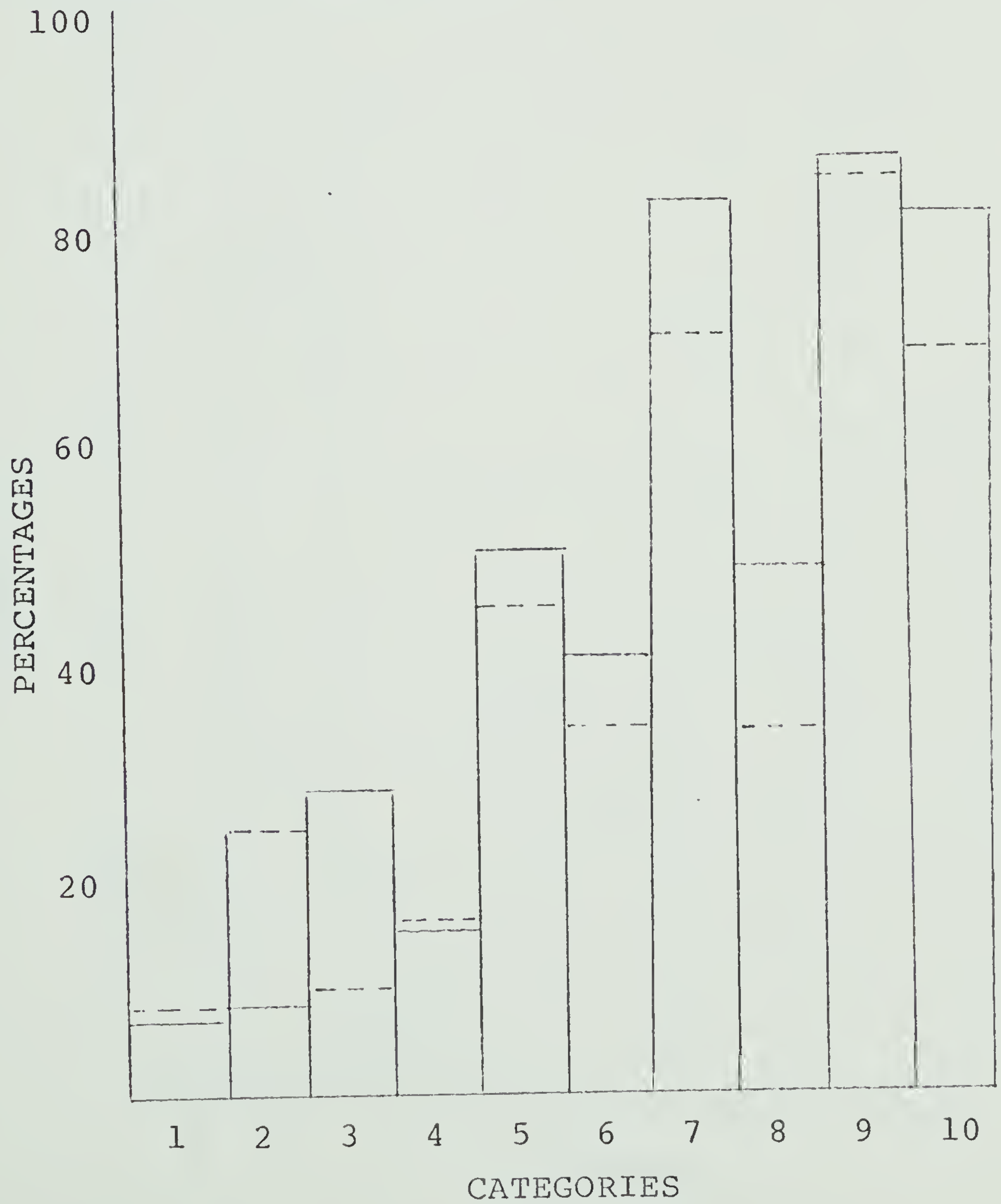


FIGURE 18--SUBJECT G

PATTERNS OF ORAL READING PERFORMANCE

1. Miscues per Hundred Words
2. Percentage Attempts at Correction
3. Percentage Miscues in Periphery
4. Habitual Associations
5. Graphic Proximity
6. Phonemic Proximity
7. Syntactic Proximity
8. Semantic Proximity
9. Syntactic Acceptability
10. Semantic Acceptability

KEY:

____ December

---- March

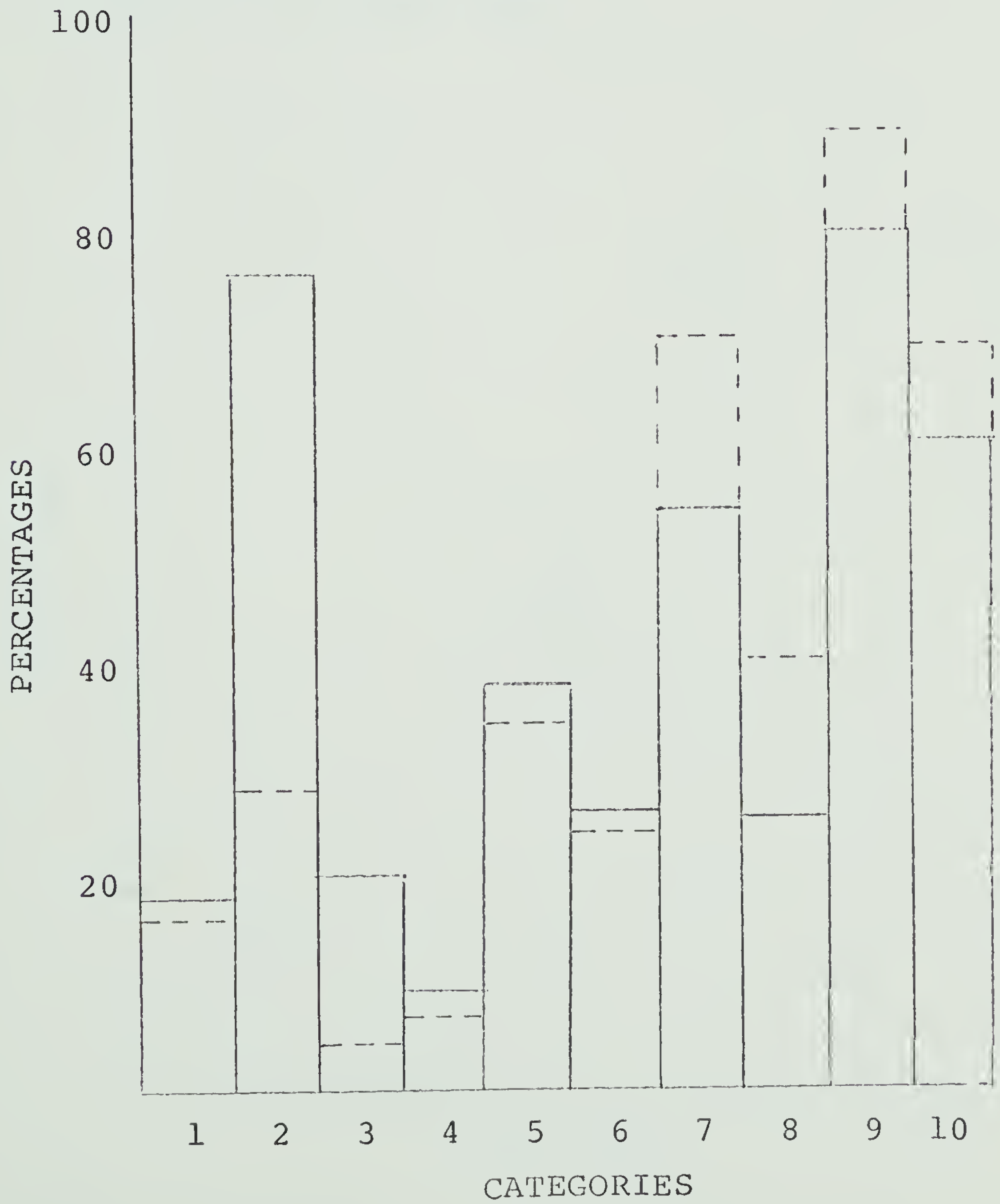


FIGURE 19--SUBJECT H

PATTERNS OF ORAL READING PERFORMANCE

1. Miscues per Hundred Words
2. Percentage Attempts at Correction
3. Percentage Miscues in Periphery
4. Habitual Associations
5. Graphic Proximity
6. Phonemic Proximity
7. Syntactic Proximity
8. Semantic Proximity
9. Syntactic Acceptability
10. Semantic Acceptability

KEY:

____ December

---- March

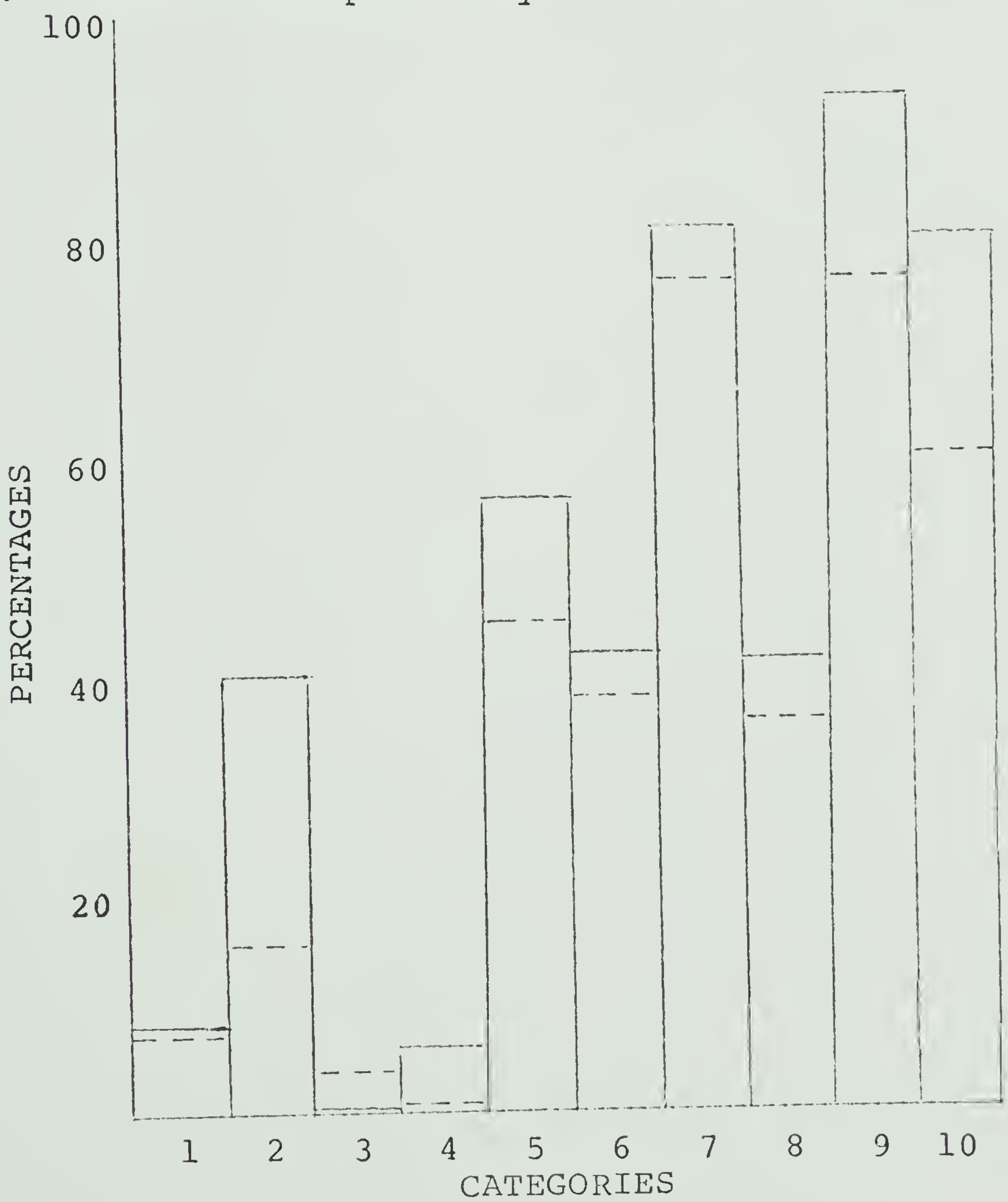


FIGURE 20--SUBJECT I

PATTERNS OF ORAL READING PERFORMANCE

1. Miscues per Hundred Words
2. Percentage Attempts at Correction
3. Percentage Miscues in Periphery
4. Habitual Associations
5. Graphic Proximity
6. Phonemic Proximity
7. Syntactic Proximity
8. Semantic Proximity
9. Syntactic Acceptability
10. Semantic Acceptability

KEY:

____ December

---- March

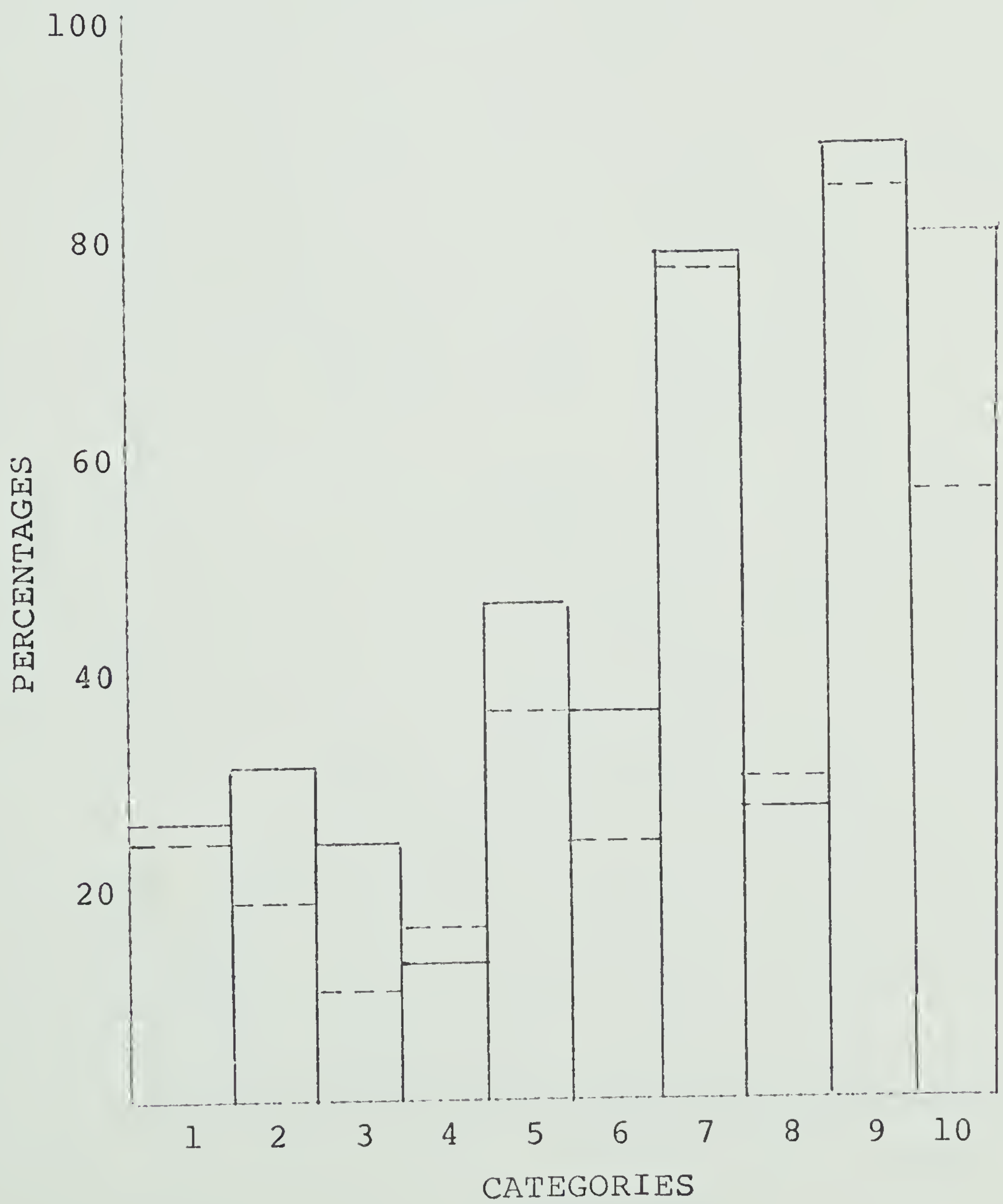


FIGURE 21--SUBJECT J

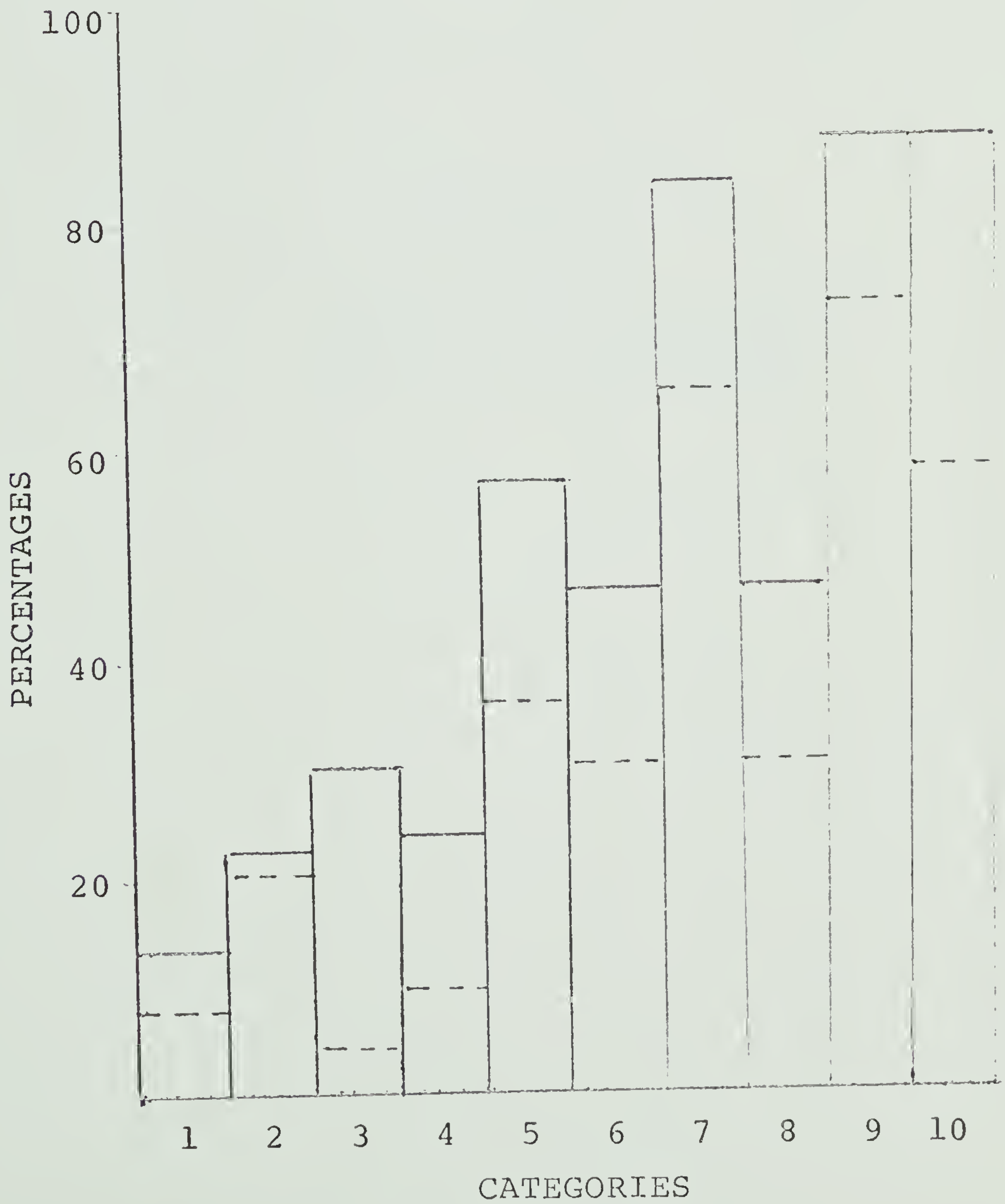
PATTERNS OF ORAL READING PERFORMANCE

1. Miscues per Hundred Words
2. Percentage Attempts at Correction
3. Percentage Miscues in Periphery
4. Habitual Associations
5. Graphic Proximity
6. Phonemic Proximity
7. Syntactic Proximity
8. Semantic Proximity
9. Syntactic Acceptability
10. Semantic Acceptability

KEY:

____ December

---- March



APPENDIX C

TESTS USED IN THE STUDY

DETROIT TESTS OF LEARNING APTITUDES

Auditory Attention Span for Unrelated Words

(See pages 39-40 and 85
of Handbook)

1	a	boy
1	b	leaf
2	a	cat ice
2	b	dog ship
3	a	man horse song
3	b	pen girl cow
4	a	cart bird desk road
5	a	head milk dress oats night
5	b	pipe west fence coat mule
6	a	fish clock heart sun box frog
6	b	stone blot freeze door cut white
7	a	skirt plant friends east tub barn hair
7	b	mud vase north ten rain cross shoe
8	a	ear boat key pig south knob ink rope
8	b	flour skate fan spend lamp wool axe toad

Score: Span ....

Total ....

ROGERS: AUDITORY MEMORY SPAN TESTS

Subject . . . .

Letters Forward

Samples: H U

I B

X C . . . .

E K . . . .

H G X . . . .

K F L . . . .

R H K A . . . .

O S F B . . . .

S R L B X . . . .

R G I X F . . . .

H L A U I L . . . .

A K G L S O . . . .

U W B I C J R . . . .

Y O A Q S E B . . . .

F X I G J B Y Q . . . .

C E S E J B R X . . . .

G I E S R L J B U . . . .

R J F Y E Q J Y H . . . .

ROGERS: AUDITORY MEMORY SPAN TESTS

Subject . . . .

Letters Backward:

Samples: B X R G I L

F J . . . . (. . . . . . .)

L C . . . . (. . . . . . .)

X J R . . . . (. . . . . . .)

W K C . . . . (. . . . . . .)

S K V B . . . . (. . . . . . .)

J Q K W . . . . (. . . . . . .)

C L J W H . . . . (. . . . . . .)

H L A C R . . . . (. . . . . . .)

G Y Q W E S . . . . (. . . . . . .)

H U F S Q B . . . . (. . . . . . .)

E Q G B L H K . . . . (. . . . . . .)

Y C H G W Q A . . . . (. . . . . . .)

C E K C A X K Y . . . . (. . . . . . .)

K S J R H S Q X . . . . (. . . . . . .)

W A E G U H R W Q . . . . (. . . . . . .)

I X C S G H S W R . . . . (. . . . . . .)

ROGERS: AUDITORY MEMORY SPAN TESTS

Subject . . . .

Digits Forward

Samples: 2 9

4 1

7 4 . . . .

6 8 . . . .

2 6 3 . . . .

7 1 2 . . . .

8 4 7 1 . . . .

7 3 9 4 . . . .

3 1 6 4 7 . . . .

8 2 4 1 3 . . . .

9 7 3 9 5 8 . . . .

3 5 2 6 4 7 . . . .

8 6 1 4 9 1 8 . . . .

7 1 5 7 4 8 6 . . . .

4 9 5 7 4 2 8 3 . . . .

7 9 4 8 1 3 9 6 . . . .

9 3 5 8 5 3 8 4 7 . . . .

2 9 1 8 6 1 7 2 9 . . . .

ROGERS: AUDITORY MEMORY SPAN TESTS

Subject . . . .

Digits Backward: 9 2

1 5

3 8 . . . .(. . . . . . .)

1 7 . . . .(. . . . . . .)

6 2 8 . . . .(. . . . . . .)

7 1 9 . . . .(. . . . . . .)

2 9 3 7 . . . .(. . . . . . .)

1 6 2 9 . . . .(. . . . . . .)

6 4 9 5 2 . . . .(. . . . . . .)

4 9 6 8 3 . . . .(. . . . . . .)

8 2 4 7 9 6 . . . .(. . . . . . .)

3 9 7 1 3 7 . . . .(. . . . . . .)

8 5 7 2 4 1 2 . . . .(. . . . . . .)

4 7 3 6 1 4 6 . . . .(. . . . . . .)

9 3 1 9 6 4 1 3 . . . .(. . . . . . .)

8 3 5 2 4 1 5 7 . . . .(. . . . . . .)

6 9 1 3 5 1 4 9 7 . . . .(. . . . . . .)

8 4 2 6 3 7 1 6 8 . . . .(. . . . . . .)

THE FAST-COSENS AUDITORY DISCRIMINATION TEST

I. Directions for the Fast-Cosens Auditory Discrimination Test

The child is seated facing the examiner. If more than one child is being tested, dividers are placed to prevent observation of responses made by other children.

Say: "I would like to find out how well you can listen. To do this, I would like to have you listen to words on this tape recorder. A voice will say two words. Sometimes the two will be just a little bit different such as my, by. I would like to have you listen to these two words and tell me if they are the same two words or if they are a little bit different: wide, ride. Are they the same or different?" Give each examinee an opportunity to respond. Say: "So each of you won't hear what the others say, I want you to show me whether the words are the same or different. If the words are the same, keep your hands on your lap. If the words are different, put your hand up. Listen to these two words: thimble, thimble. Are they the same or are they different? Show me." If any of the examinees do not make the correct response, repeat the directions. Give the following practice pairs orally

zip gyp
fell fell
nice knife
paint faint

Say: "Now I would like to have you listen to words on the tape recorder and show me whether they are the same or different. Remember, your hand up if the words are different and keep your hands on your lap if they are the same." Start the tape recorder but do not record responses until the recorded practice items have been given. The recorded practice items are:

rack rat
bag bag
cup cut
wide wide
slimmer slinger
lung rung

II. Fast-Cosens Auditory Discrimination Test

Part One

witch wish
cap cap
bug bug
pleasure pledger
chin chin
seed seed
ring wing
first thirst
volt bolt
harsh harsh
shake shake
sheep cheap
reshine reshine
sink sink
lease leash
gaze gaze
red red
hash hatch
wed wed
dare dare
pie thigh
raging raging
peeve peeve
slim sling
brimming brimming
nice nice
nice nice
leap weep
breed breathe
wife wife
bad bag
thatch thatch
shape shape
had has
region reason
mess mess
cherry sherry
lath lash
by by
thine vine
switches swishes
wishing wishing
chains change
swimming swinging
swim swim
elect erect
led led
boat boat

robe rode
clove clove
rocking rotting
van van
rash wrath
lap lap
muscle muffle
shack sack
range range
card card
lathe laid
shin shin
bathe bathe
then then
lath lass
day they
lit lit
way lay
legion legion
lash latch
by they
cup cup
teething teething
bid bid
lesion legion
laid laid
simmer simmer
fought thought
ban van
wrath wrath
lass lash
sack sack
fearing feeling
roughing roughing
thought thought
thin thin
mesh mess
lap rap
rub rub
rap wrath
day day
popping potting
sherry sherry
thatch patch
ring ring
reason reason
pick thick
grease grease

muff muff
ran rang
pie pie
peep peep
raising raging
push push
cheat sheet
bat bat
lit lick
leap leap
they vie
cashing cashing
rains range
brimming bringing
slim slim
cad cad
waking waiting

vow vow
hearth harsh
rate rate
shake sake
page page
had ha
bathe bade
they they
tenth tense
sing sing
dare there
lot lot
wait late
elect elect
pleasure pleasure
sinner sinner
mush muff

Part Two

bath bath
shief thief
muss muff
cad cab
pushy pushy
cashing catching
reep reep
feeling feeling
grief grease
thorn thorn
waking waking
winning winging
popping popping
roughing rushing
clang clang
page pays
rate late
sun sung
thy they
bail vale
rub rug
half hash
raft raft
fence thence
rung rum
cuffing cuffing
beater beaker
lot lock
peak peep
wing wing

naval naval
arriving arising
thy die
has have
lasses lashes
thigh thigh
fought fought
cog cob
hopper hotter
crutches crutches
bat that
pass pass
big bid
singer simmer
chat chap
lathe lave
dish dish
after aster
vow thou
sought thought
buzz buzz
wag rag
lashing laughing
closing clothing
late late
lens lend
lash lash
rising rising
wins wins
thank shank

rig rig
sheep sheath
latch latch
pup puff
winging winging
aster aster
witches wishes
web wed
lease lease
coke cope
puff puff
shoot shoot
laugh lash
sheep sheep
closing closing
leaf lease
thief thief
hash hash
beaker beaker
sinner singer
upper upper
refine reshine
swinging swinging
thin thin
gaze gaze
lashing lashing
red led
win wing
tug tub
lasses lasses
clam clang
muffle muffle
lake late
shape shake
rack rack
thimble symbol

arising arising
naval nasal
shot shop
peeve pease
hotter hotter
pussy pushy
first first
thence thence
bolt bolt
slitting slipping
switches switches
chat chat
thee be
mouse mouse
led leg
laugh laugh
rotting rotting
vale vale
sift shift
cap cat
lathe lathe
cuffing cussing
there there
sink think
raft waft
rising writhing
wind wins
wag wag
teething teasing
shin thin
cog cog
wreath reap
soak soak
wish wish
leap leaf
pass path

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